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comprehensive area-wide water and sewer plan

1970

STATE OF MONTANA-VOLUME 6

December 12, 1970

Department of Planning and Economic Development
State of Montana
Capitol Post Office
Helena, Montana 59601

Gentlemen:

In accordance with our agreement for water and sewer planning for forty nine of the fifty six counties in Montana, we hereby submit this Comprehensive Area-Wide Water and Sewer Plan.

This report is based on engineering and planning studies made throughout the county areas. The population characteristics and trends, the economics, and the natural resources of the counties were carefully analyzed. Based on information gathered from the study and on examination of existing water and sewer facilities, recommendations for new or improved water and sewer facilities were made where applicable.

We wish to express our appreciation for the cooperation we have received from the federal and state agencies we have worked with and from the administrative agencies, the community and civic leaders, and the residents of the counties involved.

Respectfully submitted,

Jack F. Mueller

Jack F. Mueller, PE

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INTRODUCTION

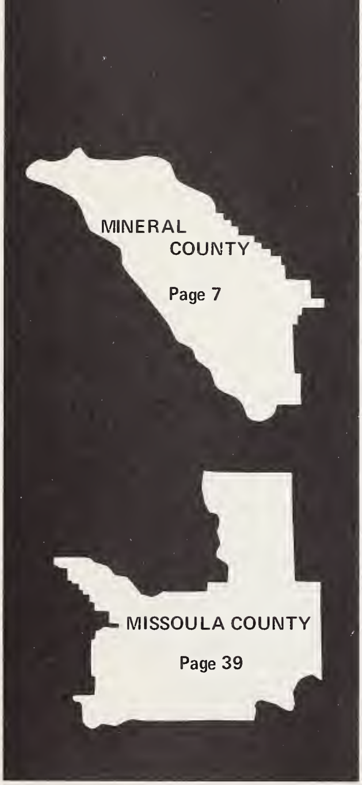
The State of Montana is basically rural in nature with the vast majority of its people still living in small rural communities and there is every indication this situation will continue for many years. It is important, therefore, to provide adequate and suitable water and sewer facilities for this rural population. The need is just as important as for the larger urban areas, but the problems of rural communities are often overlooked in our rapidly urbanizing society.

This Comprehensive Water and Sewer Study analyzes the present state of water supply and sewage disposal and is based on projected changes in population, economy, and land use. It projects improvements and additions required to meet needs during the next twenty years. Although the report is technical in nature, every effort has been taken to make it understandable to any interested person while retaining those details required for persons responsible for engineering these facilities. Adequate water and sewer facilities can be provided only with the active support of an informed and concerned citizenry.

While the general purpose of this study is to provide information necessary for coordinated planning of water and sewer facilities on a county wide basis, the specific aims of the study are to:

1. Develop an awareness on the part of the people of rural areas as to their water and sewer problems and needs.
2. Provide the information necessary for a concerned citizenry to be properly informed on water and sewer problems and needs.
3. Develop on the part of the people affected a desire to solve or prevent problems in connection with water and waste disposal.
4. Suggest the best and alternative sources of water and methods of waste disposal.
5. Prevent unnecessary duplication and underdesign or overdesign of water and sewer facilities.
6. Coordinate use of common facilities such as water supplies and waste treatment plants.

This plan encompasses all rural communities within the county containing five or more dwelling units but having a population of less than 5,500. The requirements of the Farmers Home Administration, which funded the project, and the Montana Department of Planning and Economic Development concerning water and sewer plans are satisfied by this study.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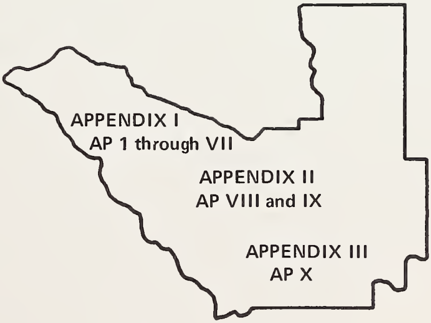
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MINERAL COUNTY

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CONCLUSIONS, RECOMMENDATIONS, AND PRIORITIES

CONCLUSIONS

The total population of Mineral County is expected to increase slightly during the planning period. Of the towns studied in the preparation of this report, only Superior shows an increase in population during the planning period. All other communities show a slight decline in population; however, the decline is relatively insignificant as far as the need for community water and sewer systems is concerned.

The existing water and sewer systems have been reviewed and improvements are proposed where necessary. Very little expansion of existing systems will be necessary; however, new systems have been proposed in communities where present population figures indicate projects are feasible. Possible proposed systems are shown where it is feasible to construct such facilities and where present systems are considered to be inadequate.

RECOMMENDATIONS

This plan shows the various types of improvements which the communities should be considering during the planning period. Elaborate systems are not proposed but rather those facilities necessary to provide safe and adequate community systems. It is recommended that this general plan be adopted by the governing agencies of each community. A detailed approach which must be undertaken to insure completion of the improvements in each community cannot be covered in a report of this type. Community leaders, however, do have several courses of action which may be taken.

Most small communities do not have the means to plan and finance complete water and sewer systems. Therefore, to enable communities to acquire such facilities, five departments of the Federal Government have legislation authorizing loans or grants for construction of public works. These agencies are:

Farmers Home Administration
United States Department of Agriculture
P. O. Box 850
Bozeman, Montana 59715

Federal Water Pollution Control Administration
United States Department of the Interior
% Montana State Department of Health
Helena, Montana 59601

Public Health Service
United States Department of Health,
Education, and Welfare
Division of Indian Health
Billings, Montana 59101

Administration for Metropolitan Development
United States Department of Housing and
Urban Development
Assistant Regional Administrator
Region VI Northwest Area Office
197 New Customs House
721 19th Street
Denver, Colorado 80904

Economic Development Administration
United States Department of Commerce
Montana Field Coordinator
207 Medical Arts Building
Butte, Montana 59701

The legislation is constantly changing; therefore, community leaders should investigate the various alternatives and determine which program and course of action would be most beneficial to them.

PRIORITIES

That a particular system requires immediate improvements and another system will be satisfactory for a definite period is difficult to establish. Several indicators for establishing priorities are available, however. The general health of the people is the prime consideration, and this can only be insured when safe water supplies are provided. Water supply in adequate quantities is another important factor. Waste water must be treated and disposed of by safe methods to minimize the problems of pollution and to protect public health. The total number of persons benefited by any improvement must also be considered. These basic criteria were used in establishing the following priority listing:

1. **Saltese Water System.** The major portion of the

present water facility is in a deteriorated condition, and this improvement is necessary to provide a safe and adequate water supply for this community. The fact that alternate sources of water supply are not immediately available makes this project feasible.

2. **St. Regis Sewer System.** The present lack of a central sewage facility and the number of persons who would benefit from such a system make the project necessary and feasible.

3. **Superior Water System.** The number of persons who would benefit from the additional storage facilities and other system improvements make this project feasible.

4. **Alberton Water System.** The number of users affected by the lack of adequate water supply during periods of high demand make this project feasible.

5. **St. Regis Water System.** The large number of users not currently served by a central system warrants planning consideration for this project.

6. **DeBorgia Sewer System.** The need for this improvement is not immediately apparent; however, it is expected that individual demand for a central system will develop in the future.

7. **Saltese Sewer System.** The present lack of a central sewage system and the number of persons which would benefit from the construction of such a system make the project necessary and feasible.

8. **DeBorgia Water System.** This facility is not immediately needed; however, it could be quite easily constructed. As sufficient demand develops, the planning of this facility should begin.

This list of priorities is not intended to govern the order in which action should be taken. The order merely ranks the severity of the problems and the need for improvements.

THE LAND

GENERAL CHARACTERISTICS

Situated in the western section of the State of Montana, Mineral County is bounded by the Counties of Missoula and Sanders and by the State of Idaho. The county's total area is 1,223 square miles. The Clark Fork and the St. Regis River constitute almost all the water surface area in the county and together account for less than one percent of the county's area.

As seen on Map 1, the county lies on the Bitterroot Mountain Range and the overall topography is quite rugged. Elevations vary widely and range from 7,600 feet above sea level on Crater Mountain to about 2,500 feet where the Clark Fork leaves the county near Alberton. Except for a narrow strip of land bordering the Clark Fork, most of the county is covered by forests of the Lolo National Forest.

The population is spread relatively evenly down through the center of the county and generally clusters near the transportation routes and in the river valleys. Superior, the county seat and largest town, is located near the center of the county area.

Mineral County is served by numerous federal, state, and secondary highways. Interstate Highway 90 travels into the county from Missoula to Superior. Leaving Superior where the interstate portion ends, the highway continues on as U. S. Highway 10 to Coeur d'Alene, Idaho. Several state and county secondary highways serve the area, and almost all join U. S. 10 or Interstate 90. Other dirt and gravel roadways serve the outlying communities.

Mineral County is provided rail service by two railroads. The electrically driven Chicago, Milwaukee, St. Paul, and Pacific rail line comes up through Missoula County to the southeast and, passing through Superior, continues on into Idaho to the west. Approximately four freight trains travel the line daily.

The Burlington-Northern Railroad parallels the Clark Fork route as does the Chicago, Milwaukee, St. Paul, and

Pacific Rail line. The Burlington-Northern Railroad moves approximately six freight trains over its rail line in the county daily. A branch line of the Burlington-Northern extends northeast of St. Regis into Sanders County.

Although there are no airports that provide connections to commercial airlines, Superior does operate a 3,400 feet paved landing field which has aircraft servicing facilities. Daily air service to nation wide airlines is available at nearby Missoula.

Power service in the county is provided by the United States Bureau of Reclamation and the Montana Power Company. Local service agencies with distribution points located at Alberton, Superior, and St. Regis purchase most of their power from the Bonneville Power Administration; this power is delivered, however, over Montana Power Company lines.

Since major power producing centers and relay stations are usually located at widely separated points and provide power service to large areas, Map 2 shows the major power grid system for the entire State of Montana. Major gas transmission lines are also shown.

Mountain States Telephone supplies the entire county area with telephone service.

LAND OWNERSHIP AND USE

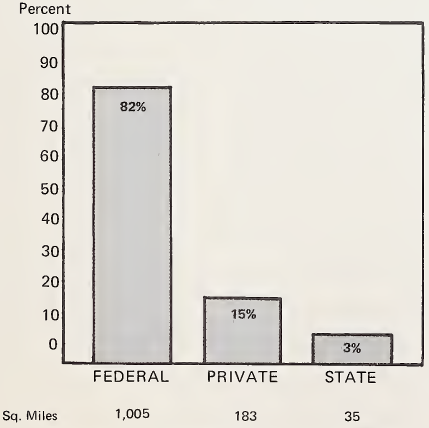
Because of the physical characteristics of Mineral County, the ownership of the land is different from that normally found. The largest landowner is the federal government with 1,005 square miles, or eighty two percent, of the land. Fifteen percent, 183 square miles, is privately owned while three percent, thirty five square miles, is state owned.

The land use of the county is reflected somewhat in its

CHART 1

Land Ownership

Mineral County

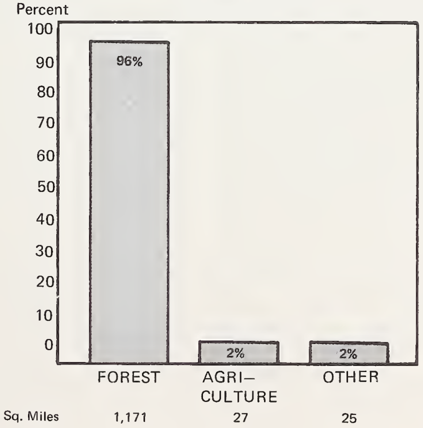


Sources: 1. The Montana Almanac 1959-60, 1962-63
2. Forest Service, U. S. Department of Agriculture

CHART 2

Land Use

Mineral County



general physical characteristics. Ninety six percent, or 1,171 square miles, of the area is covered by forests. Agriculture accounts for two percent, and the remaining two percent is used miscellaneously for such purposes as transportation routes, townsites, etc. The small amount of water surface is included in this latter category.

NATURAL RESOURCES

Mineral County receives its name from the abundance of mineral resources within its boundaries. In 1870 the Cedar Creek gold boom brought people to the county and started the town of Superior. Gold placer mines in the area such as Oregon Creek Placer and Stemwinder Placer are still producing sizeable amounts of gold today. Other minerals of economic importance found in the county are silver, copper, gold, lead, and zinc. Of the total number of twenty mines, there are six silver, five lead and copper, three zinc, and one gold mine. One of the most important mines in the area is the Nancy Lee, a lead ore mine in the Keystone District near Superior.

As earlier indicated, almost all of the county is covered by forest, and the majority of these forests are of commercial quality. Although almost all of the forested areas are on federal land, the county still receives twenty five percent of the monies derived from the sale of timber cut within its boundaries. In the fiscal year 1969 this amount was $400,694.42.

Four species of trees predominate in the forests of Mineral County. They are Douglas fir, western larch, Engelmann spruce, and Ponderosa pine. Douglas fir accounts for nearly one third of the sawtimber (those trees over eleven inches in diameter) and with the other three major species account for about four fifths of the total sawtimber volume.

Lumber is the mainstay of the forest portion of the economy in Mineral County and utilizes over eighty percent of the annual forest harvest. Mine timbers, railroad ties, posts, and poles are important lumber products in the Montana market. Among the many secondary products are the various pre cut items such as log homes and glued-up products such as fireplace logs and doors. In these forest areas of western Montana grows the largest single block of western larch in the United States, about fifty one percent of the national western larch acreage. Larch is a prime species used in the production of plywood. A development of a commercial process for extracting arabogalactan, an industrial gum, from larch has opened the way toward further utilization of that species in such specialized areas as lithography.

Mineral County, situated as it is in forested, mountainous area, provides excellent opportunities for outdoor recreation. The national forest areas supply ample camping and hiking facilities and provide ideal habitat for game animals such as elk, bear, and deer. Excellent trout fishing is found in the mountain streams, and whitefish are popular during ice fishing season. Game birds such as grouse and Chinese pheasant also challenge the hunter in the area.

In the future, recreation in the county will probably greatly increase in importance. The area, as indicated, has ideal recreational facilities with a potential as yet not realized. This situation is sure to change in the near future.

SOILS

As indicated by the land use in the county, the majority of the soils are of the forest and alpine types. Agriculture supporting soils are found in the valleys and although limited in quantity are of relatively high quality. Only very limited agricultural uses of the soil are found in the county.

Soils data is covered in detail later in this report.

WATER

The main drainage system of the county is composed of the St. Regis River and the Clark Fork and flows southeast across the county. The Clark Fork, along with the Kootenai River system, is a principal headwater of the Columbia River.

Water resources, both surface and ground water, are covered in more detail later in this report.

THE PEOPLE

POPULATION

For analytical and projective purposes, it is necessary to study the population history of Mineral County to find out what has happened and what is going to happen. Chart 3 graphically shows the growth of the county as compared with that for Montana and indicates the future growth of both.

Between 1920 and 1930 the county experienced a sharp population decline of almost one third. In 1940 the population rose sharply, arriving at a level of about one hundred less than that for 1920. A slight drop was recorded from 1940 to 1950, but a gain of almost one half occurred in the next ten years for a 1960 high of 3,037 persons. It is estimated that the population has decreased between that time and the present. It is projected that the population will grow throughout the twenty year planning period but at a rate slower than that for Montana.

In 1960 the county was classified as a rural area containing no urban areas and being located neither in nor near a major aggregate of urban population. Table 1 indicates that since 1950 the urban population has grown faster than the rural areas. Between 1950 and 1960 the urban rate was more than twice that of the rural areas. During the previous ten years, urban growth was very minimal, but the rural population declined by almost ten percent. All of the rural growth of the 1950's occurred within the rural non farm areas while the farm population actually decreased by half. Both farm and rural non farm populations declined in the last decade. The farm loss was at a rate three times greater than that for the rural non farm population.

During the period from 1950 to 1960 the county experienced a population gain of 956 persons. Chart 4 indicates that of the recorded change fifty eight percent resulted from net immigration. This gain was amplified by the excess of births over deaths.

The change in sex composition for the county from 1950 to 1960 is shown in Chart 5. As indicated, the percent of males in the total population decreased over the ten year period with a slight preponderance of males over females recorded for 1960. The ratio between the two sexes should remain fairly stable in the future.

The age distribution by sex for 1950 and 1960 is shown in Table 2. With the exception of the sixty five and over group, all age groups increased in total numbers.

A total of nine towns and communities were studied in Mineral County. The list includes the two incorporated towns of Alberton and Superior, and the unincorporated communities of DeBorgia, Haugan, Rivulet, St. Regis, Saltese, and Tarkio. The community of Lozeau was surveyed but was found to be outside the scope of this program because of insufficient population and development.

Because of the time that has elapsed since the 1960 Census, current population estimates had to be derived from several sources in the field. Surveys were undertaken to determine what now exists and what is expected in the future. Table 3 indicates the past population experience for the communities and the forecasts for the future.

The town of Superior will remain the major urban center during the next twenty years. It will grow at a reduced rate over that experienced between 1950 and 1960 and will have a 1990 population of less than one hundred over that recorded in 1960. The five to ten year growth will be absorbed within the existing confines of the town while some growth will occur southeasterly between 1980 and 1990.

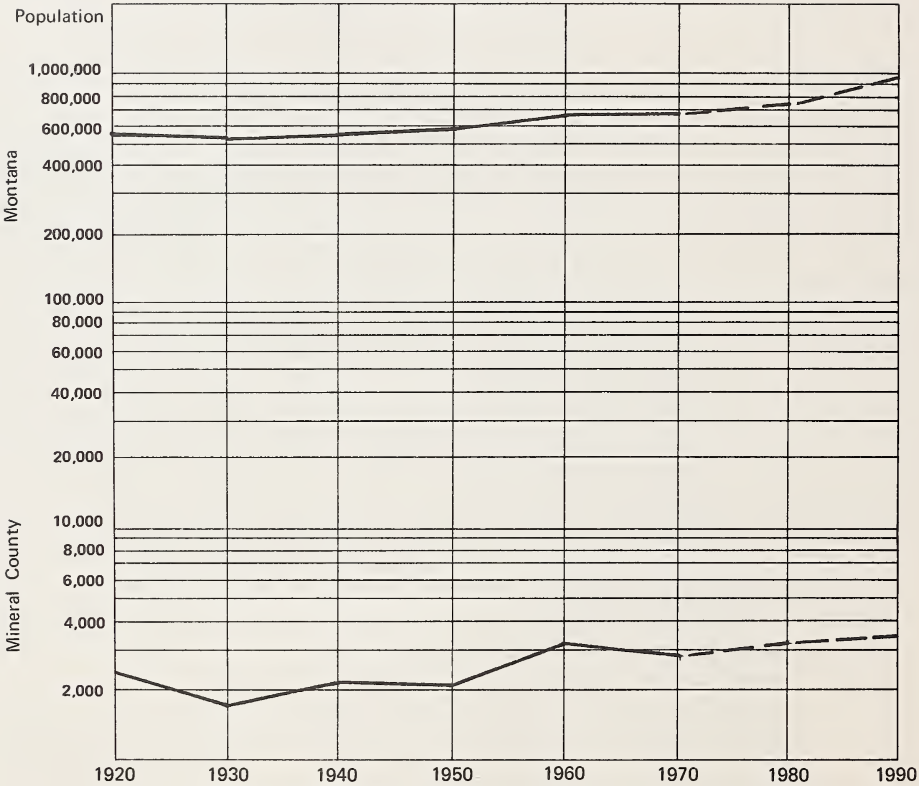
HOUSING

In 1960 there were 953 housing units in Mineral County. Chart 6 indicates that ninety five percent were classified as of the rural non farm type. The remainder were represented by farms. Since the county lacked any recognizable urban center in 1960, there was no urban classification of housing units as noted elsewhere in Montana. The median housing size was 4.20 rooms per

CHART 3

Comparative Population Trends

Mineral County and Montana 1920-1990



Sources: 1. U. S. Census of Population
2. Intermountain Planners, Inc.

unit and the median household size per occupied unit was 3.41 persons. Of those units, more than half were owner occupied while one third were used for rental purposes. Chart 7 indicates that eight percent were vacant. The condition of housing in 1960 is reflected in Chart 8 which indicates that only four percent were in need of replacement while one out of four needed repair. The remainder were classified as sound.

Chart 9 reflects the 1960 status of housing units in terms of source of water, water supply, and method of sewage disposal. For geographical reference, the data shows the status for Mineral County as a whole, and for the farm and rural non farm housing units.

In 1960 slightly more than half of all homes in the county were served by a public water system or by a private company. Those served included fifty eight percent of the rural non farms and none of the farms. One third of the farms used individual wells for water while the remaining seventy percent relied on some other method. About one fourth of all homes used individual wells while the remaining seventeen percent used some other method for their source of water.

With the exception of two percent that had no piped water at all, all homes had inside piped water in 1960. The two percent which did not have piped water were located in the rural non farm areas of the county.

Generally, sewage disposal was handled by septic tanks or cesspools in 1960. Sixty three percent of all housing employed that method. At the same time only one fourth of all housing used a public sewer for waste disposal. Those served by a public sewer included twenty five percent of the rural non farm homes and none of the farms. Three out of five farms used septic tanks or cesspools for sewage disposal and the remainder used some other method.

The population growth projections indicate that the rural non farm areas will gain during the next twenty years. These areas presently are only average in terms of availability and source of utilities as shown above. Any future major improvements should be directed to this area and its increased population as opposed to the farming homes.

TABLE 1

Urban-Rural Population Changes for Mineral County

1950-1970

			Changes	1950-1960			Changes	1960-1970
	1950	1960	Number	Percent	1960	1970	Number	Percent
Total	2,081	3,037	+956	+45.9	3,037	2,900	-137	- 4.5
Urban (Inc. Towns)	952	1,598	+646	+67.9	1,598	1,600	+ 2	+ 0.1
Rural	1,129	1,439	+310	+27.5	1,439	1,300	-139	- 9.7
Farm	387	192	-195	-50.4	192	150	- 42	-21.9
Non Farm	742	1,247	+505	+68.1	1,247	1,150	- 97	- 7.8

Sources: 1. U. S. Census of Population
2. Intermountain Planners, Inc.

TABLE 2

Age & Sex Composition of Mineral County

	1950		1960	
Age Group	Male	Female	Male	Female
Under 5	119	103	202	177
5-14	199	194	362	333
15-19	73	58	126	134
20-24	62	50	83	88
25-34	131	152	172	155
35-44	175	139	188	201
45-54	127	86	207	151
55-64	103	86	132	103
65-74	89	56	79	61
75 +	56	23	41	42
Total	1,134	947	1,592	1,445

Source: U. S. Census of Population

TABLE 3

Population Forecast for Towns and Communities Mineral County

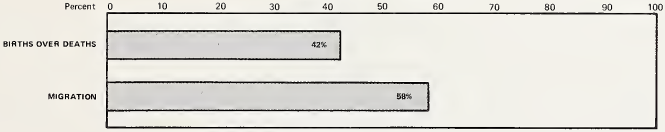
	1950	1960	1970	1975	1980	1990
Superior	626	1,242	1,200	1,220	1,250	1,300
Alberton	326	356	400	400	390	380
DeBorgia	51	75	60	55	50	50
Haugan	100	40	35	32	30	25
Rivulet	30	35	38	36	35	30
St. Regis	500	500	475	460	450	440
Saltese	87	85	90	85	85	80
Tarkio	24	30	20	20	18	15

Sources: 1. U. S. Census of Population
2. Intermountain Planners, Inc.

CHART 4

Population Gain

Mineral County 1950-1960

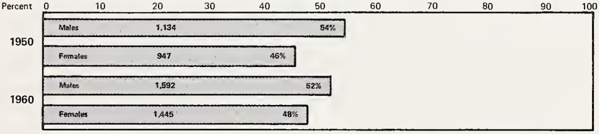


Source: Net Migration of Population, 1950-60 by Age, Sex and Color,
U. S. Department of Agriculture

CHART 5

Population by Sex

Mineral County 1950-1960



Source: U. S. Census of Population

Housing

Mineral County 1960

CHART 6

Housing Classification

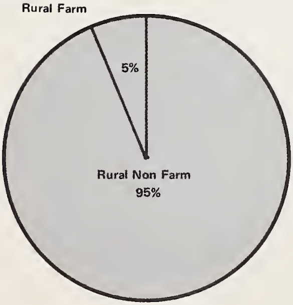


CHART 7

Housing Tenure

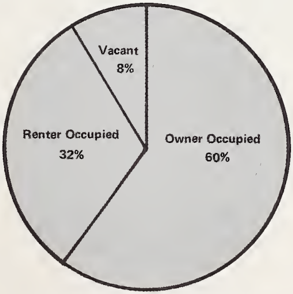
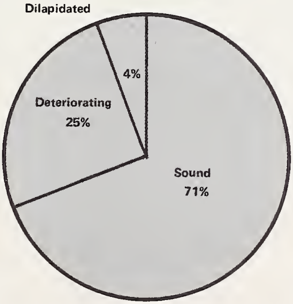


CHART 8

Housing Condition

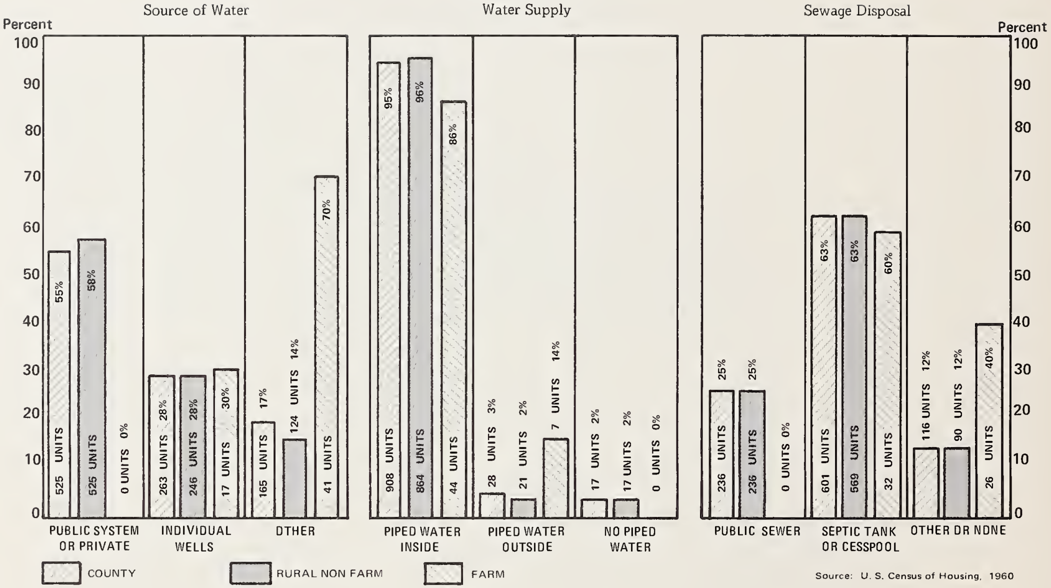


Source: U. S. Census of Housing, 1960

CHART 9

Water and Sewer

Mineral County 1960



Source: U. S. Census of Housing, 1960

THE ECONOMY

LABOR

The economy of Mineral County is dependent on people because they are both producers and consumers of goods and services. The following analysis is concerned primarily with the total economic spectrum and how it may affect the future of Mineral County. Changing economic conditions can have either a good or a bad effect on an area in terms of population growth, ability to provide for public improvements, or in determining the general over all living environment.

A significant growth in employment occurred between 1950 and 1960. The over all increase of thirty six percent greatly exceeded the six percent gain noted for Montana.

The past employment change by major industry groups is shown in Chart 10. The most significant changes were noted in the construction, manufacturing, trade, and the services and finance groups. Manufacturing was the largest group in 1960, thus continuing the preponderance it recorded in 1950. Over ninety percent of all manufacturing activity was centered in the production of furniture and other lumber and wood products. The remaining manufacturing efforts were located in the printing, chemical, and other non durable goods segments of the economy. The increases in trade were split between the retail sales and the eating and drinking segments of the group. There were no wholesale operations noted in 1960.

The services and finance group expanded as a result of the growth in other areas of the economy. This group includes such people as barbers, insurance men, bankers, beauticians, and others who provide services to those employed at the producing end of the economy.

The agricultural group decreased in numbers by more than one third during the ten year period. Because of the narrow valleys and heavily wooded hillsides, agriculture has played only a minor role in the settlement and economy of the county.

The percentages for employment by industry groups, as shown in Table 4, give an insight into the employment characteristics of the county. The table shows the relative weight of each industry group and offers a comparison with that existing for the State of Montana and the United States.

As previously mentioned, the manufacturing element in the county overshadows the other segments of the labor force. Just less than one third of the total employment was engaged in manufacturing as compared to ten percent for Montana and twenty seven percent for the United States.

One might assume that mining activities would be prevalent in "Mineral" County; in 1950, however, only ten persons were engaged in that industry while in 1960 no mining employment was recorded at all.

The available labor statistics for 1969 indicate a general leveling of the economy of the county. As seen in Chart 10, manufacturing preponderance was still noted in 1969, but because of the slowdown in home building this group experienced a slight decline. The impact of this decline, however, has a resulting effect on the total economic structure of the county as can be seen in the substantial decrease in the transportation, trade, and the services and finance segments of the economy.

A rise in employment was also recorded for the mining group. In 1969 that industry employed twenty one persons in contrast to zero in 1960 and ten in 1950.

Historically, the economy of the county has been based on forest related products. The quantity and type of natural resources, the geographical isolation, and the sparse population of the area indicate that this industry will probably continue to dominate the local economy.

A forest fire in 1910 reduced the logging potential in the county to four years from the twenty eight years that had been expected. After that a major replanting program was introduced to rehabilitate the burned over area. The United States Forest Service indicates that those areas replanted will reach a full commercial potential in one hundred years with thinning and other related activities occurring after thirty years. As time passes, the marketing potential of the forest will greatly increase with a resulting increase in forest related manufacturing activities.

AGRICULTURE

A farm is defined by the United States Census Bureau as a place having at least ten acres of land devoted to agriculture and selling at least fifty dollars worth of agricultural products annually. According to Chart 11, there were seventy five farms in Mineral County in the above category in 1964, or twenty seven percent more than in 1959.

The 1964 classification of farms by type was as follows:

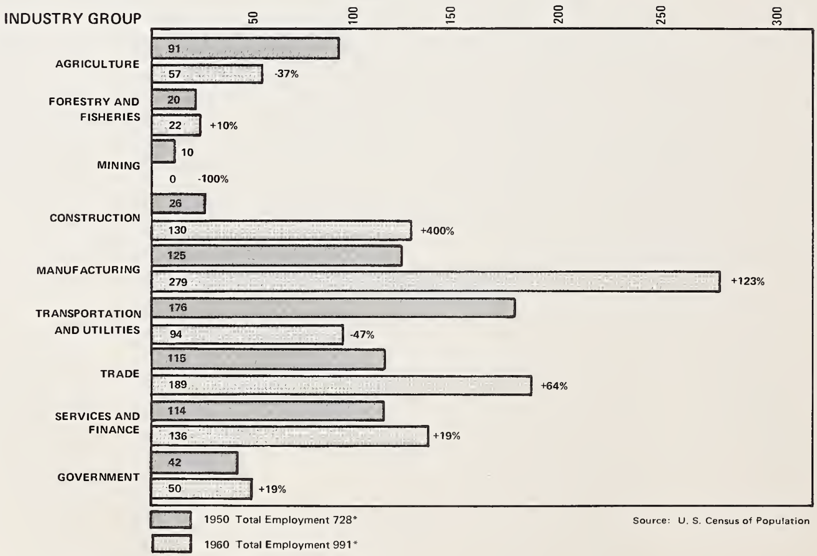
Poultry farms	1
Dairy farms	2
Livestock farms other than poultry and dairy	25
General farms	5
Miscellaneous and unclassified	42
Total	75

Of the total number of farms, thirty one were classified as part time, and seven were classified as being operated by semi retired persons.

CHART 10

Employment Change by Major Industry Group

Mineral County 1950-1960



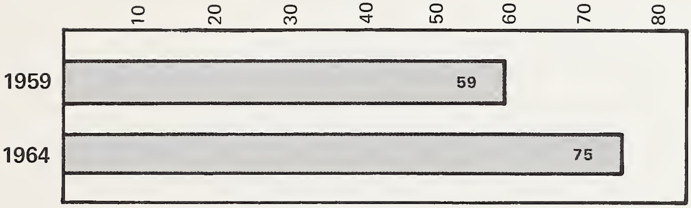
Source: U. S. Census of Population

*Includes some industries not reported

CHART 11

Number of Farms

Mineral County 1959-1964



Source: U. S. Census of Agriculture, 1964

CHART 12

Farms by Size

Mineral County 1964

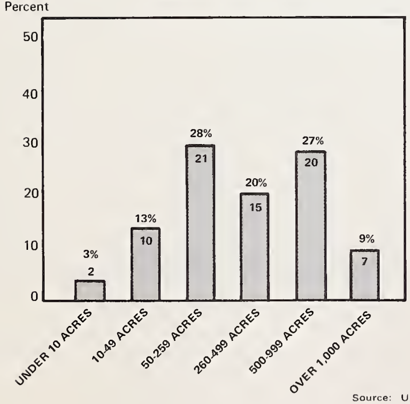
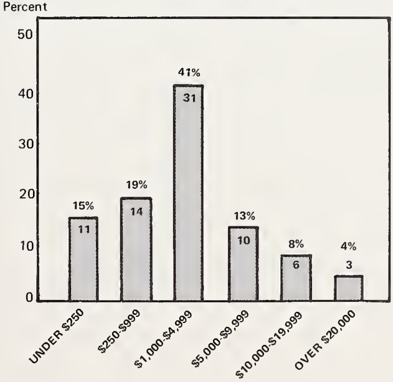


CHART 13

Number of Farms by Value of Farm Products Sold

Mineral County 1964



Source: U. S. Census of Agriculture, 1964

TABLE 4

Percent of Total Employment by Industry Groups Mineral County, Montana and United States 1960

	Mineral County	Montana	United States
Agriculture	6	17	11
Forestry and Fisheries	2	1	1
Mining	0	3	1
Construction	14	7	5
Manufacturing	29	10	27
Transportation and Utilities	10	9	7
Trade	20	21	19
Service and Finance	14	26	16
Government	5	6	13
Total	100	100	100

Source: U. S. Census of Population, 1960

In 1964 almost two thirds of all farms in the county were under five hundred acres in size while almost half were under 260 acres. The average size farm at that time was 457 acres. Chart 12 indicates the number of farms by size for that year. Only one third of all farms exceeded five hundred acres in size.

The average farm in 1964 raised livestock and was small in size when compared to the average farm in Montana. One third of all farms in that year were classified as livestock producers. As indicated, there was an obvious absence of crop producers in the county as the topography precluded the availability of adequate crop producing size parcels.

The value of products sold by the number of farms indicates the presence of the gentleman farmer class in the county. In 1964 three farms out of four sold products under $5,000 in value. Of that number as shown in Chart 13, just less than half received under $1,000 for products sold. Only twelve percent had agricultural sales in excess of $10,000.

The following cash receipts data from 1964 to 1967 provides an insight into the sales characteristics of Mineral County.

Year	Livestock	Crop	Total
1964	$168,600	$62,600	$231,200
1965	$204,500	$58,300	$262,800
1966	$246,800	$52,300	$299,100
1967	$216,200	$55,700	$271,900

In 1964 the sale of livestock accounted for three out of every four dollars received on the agricultural market. Over the four year period the percentage increased to approximately eighty percent. The amount received for all products sold is minor in relation to that for other industries and indicates the minor role agriculture plays in the local economy.

The outlook for agriculture is to continue as in the past. The number of farms and their size will remain small, and the total amount of products sold will be minor when compared to other industries.

THE GOVERNMENT

Before any meaningful consideration can be given to major capital improvement projects, it is necessary to study the governmental organizations in Mineral County and to analyze their economic structure. At present there are three separate local governmental units involved within the scope of the water and sewer study. These are the incorporated cities of Superior and Alberton and the government of Mineral County.

A Board of County Commissioners presided over by a chairman governs the county. The two incorporated municipalities are governed by a mayor council form of government.

In financing capital improvement projects, the incorporated municipalities have power to bond and raise the necessary monies for funding projects. The unincorporated small towns do not have similar power and, therefore, must rely on financing projects through the county government.

Table 5 indicates the financial condition of each unit of government in 1969.

TABLE 5

Financial Status of County Government and Incorporated Cities *
Mineral County 1969

	Revenue	Expenditure	Assessed Valuation
Mineral County	$684,794.77	$397,434.00	$10,907,077.00
Superior	259,279.32	328,348.86	1,984,471.00
Alberton	15,297.38	13,054.65	534,736.00

*There are several methods presently available to communities for financing water and sewer systems:

1. Incorporated Cities and Towns may use Municipal Bonds, Municipal Revenue Bonds, and Special Improvement District Bonds.
2. Unincorporated Towns may use Rural Special Improvement District Bonds and County Water and Sewer District Bonds.
3. Incorporated Cities and Towns and adjacent unincorporated areas may use Metropolitan Sewer District Bonds.

Source: Information received from each governmental unit

THE WATER RESOURCES

GENERAL

The water resources of any area are one of its most important assets. Montana is fortunate in that water is in abundant supply over much of the state. This is especially true in the mountain areas and along the major drainages. Water is essential for many human needs with individual consumption and sanitation being foremost. Industrial and agricultural uses of water are perhaps next most important. The recreational use of water has also become a significant factor in modern day living.

In his use of this resource, man in the past has polluted much of the available fresh water and degraded it to the point where it is unfit for many or all uses. Careful planning for the efficient use of water resources can avert inconveniences caused by pollution.

Water resources, therefore, are an important consideration in the comprehensive planning for community water and sewer system. In the following portion of this report, the existing water resources of the planning area will be briefly reviewed. The discussion will be specifically concerned with the occurrence and availability of both surface and ground water. Also important, and included in Appendix I, are the specific laws and policies of the State of Montana concerning surface and groundwater resources. "Water Quality Criteria," "Water Use Classifications," and "Policy Statements" adopted by the State Department of Health are discussed in detail. Table A in Appendix I outlines present day water quality standards as set forth by the United States Health Service.

SURFACE-WATER RESOURCES

Mineral County surface-water characteristics are typical of those found in mountainous terrain. The majority of the land area consists of mountainous topography with two major ranges predominating. The county is bordered on the northeast by the Coeur d'Alene Mountains and on the southwest by the Bitterroot Mountains. The county is also heavily timbered with portions of the Clark Fork Valley being the major timber free areas.

The wide variation in elevations add to the complex surface drainage system. Elevations in excess of seven thousand feet above sea level occur among the high peaks; whereas, an elevation just exceeding 2,500 feet occurs along the Clark Fork where it enters Sanders County east of St. Regis.

The Clark Fork is the major drainage feature of Mineral County. The river enters the county near Alberton, flows west and northwest to St. Regis, then turns northeast and east before entering Sanders County. The Clark Fork is an important tributary of the Upper Columbia River.

Another important stream in the drainage system is the St. Regis River. This river heads near the Montana-Idaho border west of Saltese and flows in a southeasterly direction to its confluence with the Clark Fork at St. Regis. Minor streams and tributaries to the St. Regis River and the Clark Fork provide drainage for the remainder of Mineral County.

The streams provide a yearlong source of water for irrigation, livestock, and domestic needs. Some of these streams have had at various times gaging stations installed by the United States Geological Survey where flow measurements are taken and recorded at regular intervals. Table 6 includes available data on the drainage area, discharge, and runoff for each gaging station pertinent to Mineral County.

The climate of western Mineral County is very similar to that of Pacific Coast Regions. Within the county itself, however, are wide variations in climate due to the extremes of topography. In general, the winters are not as severe and the precipitation averages are much higher than those of counties in Montana east of the Continental Divide.

The effect that the topography has on the climate is very important to the water resources. Prevailing west to southwest winds flowing across the high mountains provide the highest annual precipitation values. Total precipitation decreases from the mountain tops to the

TABLE 6

Stream Gaging Stations

				Discharge (cfs)						Runoff - (1000 Acre-Ft)			
Stream	Gaging Sta. Location	Drainage Area (sq mi)	See Note	Max.	Date	Min.	Date	Average	Years Averaged	Max.	Date	Min.	Date
1. Clark Fork River	At Tarkio	9,882	1,2	63,200	5/30/48	1,200	12/26/44	7,094	5	7,290	1948	3,385	1945
2. St. Regis River	Near St. Regis	303	1,2	7,740	5/28/17	45	12/11/62	558	9	529.1	1959	307.8	1966
3. Clark Fork River	At St. Regis	10,709	1	68,900	5/24/48	1,000	12/17/40	7,438	57	8,260	1916	2,476	1941

Source: "Water Resources Survey Mineral County, Montana," Montana Water Resources Board, Helena, Montana, 1970

Notes: 1. Irrigation diversions occur above these stations
2. Only short term or seasonal records available

stream valleys in a southwesterly direction across the county.

As an example of the net effect of these conditions, a precipitation measuring station near Superior in central Mineral County recorded a fifty two year average annual total of 17.60 inches. A station near Haugan on the St. Regis River in western Mineral County recorded a fifty four year average annual precipitation total of 31.40 inches. Of these totals, forty eight percent of the moisture at Superior fell during the summer months or the growing season. In contrast, precipitation patterns near Haugan reflect Pacific Coastal climatic characteristics in that nearly seventy percent of the annual moisture falls during the winter months.

Much of the precipitation during the winter months occurs as snowfall, and the resulting heavy snowpack produced in the high mountains each year contributes significantly to the water resources. Snow begins to accumulate in November in the higher mountain valleys and continues to build up till late March or early April. Portions of the high mountain snowpack remain until well into the warm summer months. The runoff from the snowpack at this time of the year enables reservoirs to be filled and periods of high demand to be satisfied.

The use of surface water is widespread for domestic, industrial, agricultural, and recreational purposes. The community of Saltese utilizes the surface water from Packer Creek and Silver Creek for its municipal supply. (See Table 7 for chemical analysis of the Saltese municipal water supply. See Table A in Appendix I for accepted water quality standards.) Many acres are currently being irrigated and a potential exists for more development. Industrial uses vary considerably; however, uses involving the lumber industry predominate. A final but important use of surface water is for recreational purposes. The mountain lakes and streams are ideal habitat for fish and waterfowl and draw many fishermen, hunters, and campers to the area each year.

WATER USE CLASSIFICATIONS

The Water Pollution Control Council has classified the streams and drainages in Montana according to the water use classification definitions shown in Appendix I. The streams and drainages of Mineral County and surrounding areas are classified as follows:

Clark Fork River Drainage from the Little Blackfoot River to the Idaho line except those portions of tributaries listed below:	B–D_1
Georgetown Lake and tributaries above Georgetown Dam	A–Open–D_1
Flint Creek Drainage from Georgetown Dam to the Farm-to-Market Highway No. 348 bridge about one mile west of Philipsburg except those portions of tributaries listed below:	B–D_1
Fred Burr Lake and headwaters from source to the outlet of the lake	A–Closed

Flint Creek (mainstem) from Farm-to-Market Highway No. 348 bridge about one mile west of Philipsburg to the Clark Fork River	B—D_2
South Boulder Creek Drainage to the Philipsburg water supply intake	A—Open—D_1
Remainder of South Boulder Drainage	B—D_1
All other tributaries to Flint Creek from F-to-M Highway No. 348 bridge to the Clark Fork River	B—D_1
Rattlesnake Drainage to the Missoula water supply intake	A—Closed
Remainder of Rattlesnake Drainage	B—D_1
Packer and Silver Creek Drainage (tributaries to the St. Regis River) to the Saltese water supply intakes	A—Open—D_1
Remainder of Packer and Silver Creek drainages	B—D_1
Ashley Creek Drainage to the Thompson Falls water supply intake	A—Closed
Remainder of Ashley Creek Drainage	B—D_1
Pilgrim Creek Drainage to the Noxon water supply intake	A—Open—D_1
Remainder of Pilgrim Creek Drainage	B—D_1
All tributaries of Clark Fork River not otherwise mentioned	B—D_1

GROUND-WATER RESOURCES

Ground water obtained from wells and springs is used by the majority of the residents of Mineral County primarily for domestic purposes and to a lesser degree for livestock, irrigation, public and municipal, and industrial purposes. As of January 1970, 150 wells and thirty two springs were on file at the Montana Bureau of Mines and Geology at Butte. The 150 wells were divided into the following water use categories: 101 domestic (sixty seven percent), eighteen domestic and stock (twelve percent), twelve public and municipal (eight percent), ten irrigation (seven percent), and nine industrial and commercial (six percent). All wells on file are located along the Clark Fork and the St. Regis Valleys. The majority of the springs were used for domestic and stock water purposes.

No detailed reconnaissance hydrogeological investigations have been conducted in Mineral County. Two informative geological reports covering parts of Mineral County are (1) Campbell, A.B., 1960, Geology and mineral deposits of the St. Regis Superior area, Mineral County, Montana: U.S. Geological Survey Bulletin 1082-1, page 545 to 612, and (2) Wallace, R.E., and Hosterman, J.W., 1956, Reconnaissance geology of western Mineral County, Montana: U.S. Geological Survey Bulletin 1027-M, page 575 to 612.

The geological history of Mineral County involves long periods of sedimentation, regional uplift, structural deformation, and erosion. During Precambrian time (over 600 million years ago), thousands of feet of sediments were deposited in Mineral County. Sedimentation probably continued (interrupted only by brief periods of uplift and erosion) throughout Paleozoic (225 to 600 million years old) and Mesozioc (seventy to 225 million years old) time. Widespread regional uplift and structural deformations occurred in Early Tertiary time (fifty to seventy million years ago), and all the Mesozioc and most of the Paleozioc sediments were removed by erosion. Scattered remnants of Paleozioc rocks are present in the southern part of the county. The steeply dipping northwestward trending faults are the most salient structural features in the area. Extensive vertical and horizontal displacement has occurred along the major faults, such as the Osborne, Boyd Mountain, Verde Creek, and many others. The Clark Fork Valley between St. Regis and Tarkio is an example of a large down faulted block.

Much of the Clark Fork drainage basin in northwestern

Montana was submerged by "Glacial Lake Missoula" during Pleistocene time (twenty thousand to one million years ago). Lobes of the Cordillerian glacier periodically advanced southward along the Purcell Trench in northern Idaho and dammed the Clark Fork near the Montana-Idaho border. The impounded water in the Clark Fork Valley rose to an altitude of 4,150 to 4,200 feet, which covered all the lowland area in Mineral County. Small valley glaciers occupied many of the higher mountain valleys in the Bitterroot Range to the southwest.

The quantity, quality, and distribution of ground water in Mineral County is directly related to the geology of the area. The geological units of considerable importance are (1) metasedimentary rocks (sedimentary deposits which have been partially metamorphosed) of Precambrian age, (2) outwash, terrace, till, and lake deposits of Pleistocene age, and (3) alluvial flood plain sediments of Recent age (less than twenty thousand years old).

The area is underlain by about fifty thousand feet of metasedimentary rocks of the Precambrian Belt series. Rocks of the Belt series, subdivided into the pre-Ravalli (oldest), Ravalli, Piegan, and Missoula (youngest) Groups, are typically quartzites and argillites or mixtures of these two rock types which have been folded, faulted, and subjected to very low-grade regional metamorphism. Scattered lenses of dolomitic limestone are frequently present in the upper part of the Piegan Group. Because the Belt rocks are tightly compacted and have low porosity and permeability (ability to hold and transmit water), only small quantities of water, one half to five gallons per minute (gpm), can be expected from wells unless extensive weathered and/or fractured zones are encountered. Extensive fractured zones are commonly encountered adjacent to the major faults in the area, and properly located wells should yield two to five gpm per one hundred feet of drill hole.

A few exposures of Paleozoic rocks overlying the Belt Series are present in the southeastern part of the county. The water bearing characteristics of these sediments are unknown; however, they are probably quite similar to the underlying Precambrian strata. Precipitation is the primary source of recharge to all the bedrock formations.

All the major valleys in Mineral County contain deposits of Pleistocene age which cover much of the underlying bedrock. These deposits are glacial till which consists of unsorted and compacted mixtures of gravel, sand, silt, and clay, as well as stratified material forming glacial outwash and buried channel deposits, terrace gravels, and lake beds.

Glacial till fills many of the high mountain valleys along the Bitterroot Range. In general, the till is quite thin and has very low permeability (ability to transmit water); consequently, only small quantities of water (one to five gpm) can be obtained from wells drilled into this material.

Well log information indicates that glacial outwash and/or buried channel deposits are commonly encountered along the Clark Fork and to some extent along the St. Regis River. Wells drilled into these deposits are generally over 120 feet deep, under some artesian pressure; and, if fifteen or more feet of well sorted sand and gravel are encountered, yields up to one thousand gpm can be anticipated. A number of flowing wells have been reported in the St. Regis and Rivulet areas. The communities of Alberton, Rivulet, St. Regis, Superior, and Tarkio obtain large quantities of water from these deeper aquifers (water bearing units).

Well defined terraces or benches composed of sand and gravel with some silt and clay are also present along the Clark Fork and St. Regis River valleys. The four most prominent terraces are about fifty, 150, 450, and 650 feet above the river. In general, nearby streams have dissected the higher terraces, allowing them to be drained; consequently, very little water can be expected from the upper terraces. The low level terraces are much more extensive, relatively undissected, and will commonly yield five to fifty gpm to properly located wells twenty five to fifty feet deep

Exposures of Pleistocene lake sediments consisting of light colored, thinly laminated clay and silt are found in many parts of the valley. The lake beds are generally quite thin and practically impermeable; thus for all practical purposes these sediments can be disregarded as a potential water bearing unit.

The majority of the shallow wells in Mineral County obtain water from the Recent alluvial flood plain deposits adjacent to the Clark Fork and St. Regis Rivers. These sediments are composed of stream laid silt, sand, and gravel and are recharged by the nearby rivers. Most wells are less than fifty feet deep and have reported yields of twenty five to five hundred gpm. All the communities in the county obtained at least part of their water from the shallow flood plain alluvium.

The quality of ground water in the county is good to excellent. The water is commonly hard, containing one hundred to 150 parts per million (gpm) hardness, low in total dissolved solids (thirty to two hundred (gpm), and calcium and bicarbonate are the predominate dissolved constituents.

In summary, the shallow alluvial flood plain sediments and the deeper buried channel and glacial outwash deposits adjacent to the Clark Fork and St. Regis Rivers are the primary aquifers in the county, providing the majority of the ground water used in Mineral County. These aquifers are virtually untapped at the present time and are probably capable of producing additional ground water to meet future requirements. Detailed hydrogeological investigations are needed in Mineral County.

Sources:
1. M.K. Botz, Montana Bureau of Mines and Geology, Butte, Montana, 1970
2 State Department of Health, Helena, Montana
3. ''Water Resources Survey'' Mineral County, Montana, Montana Water Resources Board, Helena, Montana, 1970

TABLE 7

Chemical Analysis of Municipal Water Supplies (All Figures in Milligrams per Liter)*

City or Town	Alberton	Saltese	Saltese	Superior	Superior
Source	Spring	Silver Creek	Packer Creek	Springs	Well
Date	8/62	5/69	4/59	8/64	8/64
Total Solids	222	48	30	176	132
Hardness	224	60	50	179	138
Ca	40	8	2	41	33
Mg	31	10	11	19	14
Na+K	2	0	0	1	0
CO_3	0	0	0	0	0
HCO_3	268	49	18	195	140
SO_4	2	1	.3	17	14
Cl	2	7	0	0	0
NO_3	1	0	0	0.0	0.0
F	0.0	0.16	0	0.0	0.0
Fe	0.0	0.9	0.1	0.00	0.00
As	-	-	0.0	0.005	0.00
Pb	-	0.00	0.0	0.00	0.00
Cu	-	0.00	0.05	0.00	0.00
Zn	-	0.0	-	0.0	

*See Appendix I, Table A, for accepted water quality standards
Source: State Department of Health, Helena, Montana

THE SOILS

GENERAL

General descriptions of soils in specific areas are useful in predicting the potential problems which might be encountered during private and public works construction. Mineral County has an interesting and quite complicated geologic history which has greatly influenced the soil structure of the area. The dominating geologic features are the deep river valleys bordered by high mountain ranges.

The original source of the soil parent materials is primarily the Precambrian quartzites and argillites of the Belt Formation. The majority of the parent materials were transported and deposited during valley glaciation and thus the soils resulting consist of glacial material, alluvium, and lake deposits or the alterations of these materials due to various conditions of climate, topography, and living organisms.

SOIL MAP

The Soil Conservation Service of the United States Department of Agriculture has prepared a general soils map for Mineral County. The map as presented by them is shown in this report as Map 4. In developing this map, the Soil Conservation Service made field studies and observations which resulted in the designation of eleven soil associations. Each soil association as a rule contains a few major soils and several minor soils. Soils within an association may differ greatly in short distances and any one soil may occur in more than one association. Thus, the general soils map does not show the kind of soil at any particular point, but shows specific patterns of soils.

The Soil Conservation Service preliminary draft descriptions of the eleven soil associations shown on the general soils map are presented as follows:

Soils on the Mountain Slopes

1. **Andic Cryochrepts and Alfic Andic Cryorthents (Holloway-Tamely Association, very cold phase):** These are very cold, light colored soils under forest at very high elevations on mountain crests and very steep upper slopes, over argillite and quartzite rocks. They are dominated by a thin ash mantle on deep, very stony, acid silt loam and ash-mantled, deep, very stony, acid sand.

2. **Andic Lithic Cryochrepts and Rockland (Coerock-Rockland Association):** These are cold, light colored, forested soils on very steep mountain slopes at high elevations. They are dominantly shallow, acid silt loam over argillite and quartzite with associated rock outcrop.

3. **Typic Cryochrepts and Rockland (Blackleed-Rockland Association):** These are cold soils of the high elevation mountain grasslands on granite bedrock. They are dominated by deep, very gravelly, acid loam with a very thin, dark colored Al horizon and associated rock outcrop.

4. **Typic Cryandepts and Aquic Cryoborolls (True-fissure-Wishard Association):** These are cold, deep soils on the forested mountain slopes over argillite and quartzite bedrock. Dominantly well drained, light colored, moderately thick, ashy over very cobbly, acid silt loam on steep slopes and poorly drained dark colored, very cobbly, acid silt loam on moderately steep slopes.

5. **Andic Cryochrepts and Udic Ustochrepts (Craddock-Drexel Association):** These are cold and moderately cold soils on forested, steep mountain slopes with thin ash mantle at high elevations and no ash mantle at intermediate elevations. They are dominantly deep, light colored, very gravelly, acid silt loam soils over hard shale bedrock.

6. **Alfic Andic Cryorthents and Typic Eutroboralfs (Tamely-Coldcreek Association):** These are soils on forested mountain slopes over argillite and quartzite bedrock. They are dominantly cold, deep, light colored, very stony, sandy, acid soils with thin ash mantle on steep slopes at high elevations, and moderately cold, deep, light colored, stony loam neutral soils on moderately steep slopes at moderately high elevations.

7. Andic Cryochrepts and Udic Ustochrepts (Holloway-Winkler Association): These are soils on forested mountain slopes over argillite and quartzite bedrock. They are dominantly light colored, very stony silt loam acid soils with very thin ash mantle on cold, high elevation, very steep slopes and without ash mantle on moderately cold, moderately high elevation, very steep slopes.

Soils on the Valley Floor

8. Typic Vitrandepts and Andic Ustochrepts (Nevine-Krause Association): These are moderately cold, light colored, acid soils on the forested, nearly level valley floor. They are dominantly deep, well drained, light colored, moderately thick ash over very gravelly loam and thin ash mantle over very gravelly sand.

9. Udic Ustochrepts and Typic Hapoborolls (Entente-Tally Association): These are moderately cold soils on undulating and level valley floors. They are dominantly deep, well drained, light colored, neutral to alkaline silt loam soils under forest and deep, well drained, dark colored, neutral to alkaline loam soils under grass.

10. Typic Eutroboralfs and Andic Cryoboralfs (Half Moon-Savenac Association): These are deep, light colored soils on forested, level to undulating valley floors. They are dominantly moderately cold, well drained, neutral to calcareous silt loam soils of the Clark's Fork River valley and cold, ash-mantled, well drained, acid to neutral, clay soils of the Saint Regis and lower Clark Fork River valleys.

11. Typic Ustifluvents and Made Land (Alluvial Land and Mine Pits and Dumps): These are dominantly well drained and poorly drained alluvial land riverwash along the river channels and placer mine pits and dumps.

CONCLUSIONS

The soils of Mineral County have generally been easy to deal with where shallow domestic water wells and individual sewage drainfields have been constructed. The large amounts of glacial material and alluvium have been found to be extremely variable in permeability, however. This has had an affect on both the quantity of water available in shallow domestic wells and the successful operation of individual sewage drain fields. Some areas of extensive clay and silt deposits require special care in the construction and operation of septic tank drain fields.

Construction of municipal water and sewer systems in the various soils of Mineral County has not been found to be difficult. Pipeline trench digging in the sands and clays is extremely easy while the coarse stream gravels slow operations somewhat. Some bedrock can be expected at normal water and sewer line installation depths.

Source: 1. U. S. Department of Agriculture, Soil Conservation Service, Missoula, Montana

COMMUNITY WATER SYSTEM FACILITIES

GENERAL

This comprehensive report covers the overall problems, existing or projected, for Mineral County, Montana. The volume of data processed and evaluated and the intent of the report allow only a general analysis of any one system.

The intent of this report is to point out the overall needs of each community with the objective that each community may in the future be provided with a safe and adequate water system. The general solutions to overall problems suggested in this report may have to be modified when detailed studies are made. These modifications may be in exact size of parts of a system or in some detailed design variation but will not detract from the overall value of the general information presented.

Basically, the demand for water from community systems is for domestic, fire fighting, and industrial uses. The demand for industrial water supply in small communities has not been extensive in Montana and in most cases will not control the design of community systems. Sufficient water for fire fighting must be considered; however, economic feasibility will usually control the extent of such facilities. In most small communities, a system with sufficient capacity to give high ratings for fire protection would require facilities considerably larger than necessary for domestic purposes. The community might be unable to finance such an improvement; the approach, therefore, has been to propose a system suitable for present domestic needs. These basic facilities can be expanded for more complete service and for higher fire ratings as it becomes economically feasible.

The domestic use of water has increased greatly in recent years. This is partially due to improved economic conditions which make it possible for families to acquire such water consuming appliances as dishwashers, waste disposal units, and automatic washing machines. Water usage for beautifying property has also increased. The most essential condition is adequate, safe, and potable water for domestic purposes, and this has been the primary consideration in this study. See Appendix II for further comments on analysis criteria.

BASIC CONSIDERATIONS

Communities studied in this comprehensive plan were those with a minimum of five potential users and a maximum population of 5,500. Each community within this category was visited at least once. During these visits the type of water facilities available was examined, and an evaluation of the facilities was made from the standpoint of fulfilling the needs of the residents.

The existing systems were found to be quite varied in their operation, condition, and suitability for serving the needs of the users. The situation in each community was evaluated separately; however, some general classification of the various systems was possible. These are described briefly in the following paragraphs so that the general philosophy of the analysis can be shown.

1. In some communities, the homes are quite widespread and few in number. Good water in adequate quantities can be found at reasonable depths. For such situations, private wells will provide a safe and suitable water system.

2. Many communities have had access to good water from private wells for many years. In some of these communities, population is increasing, and the area is becoming more densely settled. As a result, tests for bacteriological quality of well water occasionally indicate that pollution is present. When this occurs, it is usually the beginning of a problem which will continue to worsen. Increasing population and a higher potential for contamination indicate the need for a safe community water facility. The system should be one which will serve the domestic needs of the residents now with provisions for improvements and expansion as needed.

3. Many communities have enjoyed a central water system for years but have not made annual improvements and replacements. This has resulted in overloaded and antiquated systems. Suggestions for immediate im-

provements which will fit into an overall replacement program are included in this report.

4. Some communities which have experienced a steady population growth are finding that their water systems are inadequate for present demands and will require enlargement. Population projections and economic trends are used to determine the need for improvements and also to justify the type and extent of proposed improvements.

MINERAL COUNTY

The estimated 1970 population of Mineral County is 2,900. Approximately 1,690, or fifty eight percent, of these people are presently served by central water systems and the remainder are served by private facilities such as wells and springs. By 1980 about 2,175, or sixty eight percent of the population, will have access to central water systems if the schedule of proposed improvements is followed. It is expected that the remaining thirty two percent will live in outlying areas, and the homes will not be close enough together to make central systems feasible.

SUPERIOR

Existing System. The estimated 1970 population is twelve hundred. The area presently served by the community water system is shown on Map 5.

Water supply for the system is obtained from two wells located in town and a surface collection system on Flat Creek north of town. The two wells together are capable of producing approximately eight hundred gallons per minute (gpm), and the surface source is estimated to supply approximately seventy gpm. The quality of water from all sources is generally good although the water tends to be moderately hard. The distribution system consists of small diameter pipe which is systematically being replaced by four and six inch steel pipe. The condition of the existing distribution piping is generally good, and the system provides adequate flows at the present time. The present Flat Creek transmission line is twelve inch wood pipe in fair condition. Plans have been made for replacing the wood transmission line with ten inch steel pipe. Deteriorated portions of the wood main in town are being replaced with cast iron pipe. The only storage provided for the system is a 25,000 gallon steel tank located on the Flat Creek transmission line north of town. This tank also serves as a surge tank and overflow facility for the surface-water supply.

Improvements Next Five to Ten Years. The population is expected to be 1,220 by 1975. During this period it is proposed that a new storage facility be constructed north of town. This improvement is necessary to provide a reserve supply during emergencies such as breakdown of pumping facilities or major fire. Although present flows and pressures are adequate, they can be improved by continued replacement of small diameter distribution lines and by looping dead end portions of the system.

Improvements by 1990. The population is expected to be thirteen hundred by 1990. The present system together with the improvements proposed under the five to ten year plan will result in a facility which is adequate for the needs of this population. Replacement of older lines on an annual basis and extension of the distribution system into growth areas will be necessary during this period. The existing supply facilities have adequate capacity for the needs of the town throughout the planning period.

ST. REGIS

Existing System. The estimated 1970 population is 475. The people of St. Regis obtain their water from individual wells. The quality of the water is good; however, there is an iron content which contributes a slight color to the water. Plenty of ground water is available in the area, and there are no pollution problems at this time. Most of the wells are driven and cased and they average from fifty eight to 150 feet in depth. Artesian flows are often obtained from wells driven to the 150 foot depth. Water supply from individual wells is currently adequate for this community. The size of the population, however, indicates that a central water system would be feasible. Homes in the community are widespread, and the economics of a central system would be a major consideration.

Improvements Next Five to Ten Years. The 1975 population is expected to be 460. This is sufficient to warrant the construction of a central water system. The demand for these facilities may not develop to a point where construction of a system is warranted during this period; however, it is proposed that the necessary planning begin. Indications are that a well capable of producing 250 gpm could easily be developed, and a storage facility with a capacity of 100,000 gallons is proposed. These facilities together with the necessary distribution system would adequately serve the community throughout the planning period. The proposed water system and service area are shown on Map 6.

Improvements by 1990. The 1990 population is expected to reach 440. The system as proposed would continue to serve the community adequately, and it is not anticipated that any further improvements would be necessary during this period.

ALBERTON

Existing System. The estimated 1970 population is four hundred. The community is presently served by a central water system which is shown on Map 7.

Alberton receives its water supply from springs developed on the hill northwest of town. According to the criteria of this report, the capacity of the water supply is less than that required during periods of high demand. Actual reports from the town indicate that there is water shortage during the summer months. Recent improvements to the existing water system consisted of the installation of a new 300,000 gallon steel storage tank and chlorination treatment. The original 65,000 gallon concrete storage facility is in good condition and is also available for use. Recent improvements also included replacement of some distribution piping; however, a considerable amount of small diameter pipe still remains in the system. The quality of the water obtained from the spring is generally good; however, the water is quite hard.

Improvements Next Five to Ten Years. The population is expected to be four hundred by 1975. During this period it is proposed that additional water supply be developed for this system. This improvement is necessary to provide adequate flows during periods of high demand. Based on the criteria of this report, maximum demand of four hundred gallons per capita per day for a nine day period would result in consumption of the stored water and a subsequent water shortage. A one hundred gpm supply facility operating on a twelve hour period would be adequate to supplement the existing spring supply and would reduce the possibility of water usage exceeding the storage and supply capacity. Another possibility of alleviating this situation would be to provide metering or otherwise restrict the use of water to an amount equivalent to the daily spring yield. Also, during this period steps should be taken to replace small diameter distribution lines in the system. Service to outlying areas and looping of dead end lines should also be provided.

Improvements by 1990. The population is expected to be 380 by 1990. The present system together with the improvements proposed under the five to ten year plan will be adequate to serve the town throughout the planning period. Replacement of older small diameter piping and looping of dead end lines may still be necessary during this period.

SALTESE

Existing System. The present population is estimated to be ninety. The people of this community are served by individual wells and a central water system as shown on Map 8. The quality of the water from the wells is good, and there is no problem obtaining adequate quantities. The depth of the wells averages seventy feet, and only normal operational problems have been encountered.

The central water system was built in 1903 and is privately owned. There are approximately eighteen homes hooked on to the system at the present time. Treatment of the water consists of the addition of chlorine at each of two sources. The sources are a small reservoir on Packer Creek approximately one mile north of town and Silver Lake approximately six miles southwest of town. Water from the Packer Creek source flows down the mountain in a twenty one inch wood pipe. Portions of the wood pipe near the community have been replaced with two and one half inch iron pipe.

The distribution system in the community is eight inch wood pipe. Water from Silver Lake flows to the community in six inch wood pipe, three inch iron pipe, and into the eight inch wood distribution system. Water pressure is approximately forty pounds per square inch. The quality of the water obtained from the surface sources is fair to good.

The existing central water system is in a deteriorated condition and is difficult to maintain. Some planning for the replacement of the system has been done and much depends on the location and subsequent completion of Interstate Highway 90 through the community.

Improvements Next Five to Ten Years. The population is expected to be eighty five by 1975. Replacement of the existing central water system is proposed during this period. The system proposed is shown on Map 8. It consists of a well located in the community supplying fifty gpm and a 25,000 gallon storage tank located on the hill south of the community. The supply and distribution system would consist of six inch pipe.

Improvements by 1990. The population is expected to be eighty by 1990. The system proposed in the five to ten year plan will be adequate to serve the community during this period. No other improvements or expansion of the system are believed to be necessary throughout the planning period.

DeBORGIA

Existing System. The estimated 1970 population is sixty. The residents of DeBorgia obtain their water from individual wells. Most wells are drilled but some are dug wells which are quite shallow. The quality of water obtained is quite good and quantities obtained are adequate. The depth of the drilled wells ranges from twenty to sixty feet with the average being around forty feet. Only normal operational problems have been encountered with these individual systems, and there has been no consideration of a central water system.

Improvements by 1990. The population of DeBorgia is expected to be fifty by 1990. A community water system facility is feasible for a community of this size. Should the local demand for improved facilities develop during this period, a system as shown on Map 9 would adequately serve the needs. A well capable of producing thirty gpm could be developed at a location in the community. Development of existing springs northeast of the community would also be an alternate source of supply. Economic considerations would determine whether use of the springs would better serve the community. Storage for the system would be provided by a twenty thousand gallon tank located on the hill northeast of the community. The system as proposed would be adequate for the needs throughout the planning period.

COMMUNITY SEWER SYSTEM FACILITIES

GENERAL

Each use of water adds some material or alters some characteristic enough to change the original quality of the water and often to pollute it. The transportation and dilution of municipal, industrial, and agricultural wastes are important and necessary uses of water; therefore, special emphasis is placed on the control of water pollution from these sources. Some of these wastes can be carried in limited amounts without damage to the resource. Some wastes if discharged into water courses can make their way into underground aquifers and pollute the ground water so that it is unsuitable for further use.

Pollution by definition and interpretation is a matter of degree. Since it is inevitable that the quality of water will be altered with each use, it is of critical importance to control the degree of pollution.

It is public policy, established by the state legislature, to maintain reasonable standards of purity for the water of the state. These standards are to be consistent with the use of these waters, including their use in carrying away the water borne waste products of society. The current Federal Water Pollution Control Act in reference to pollution abatement gives the individual states discretion in assessing the physical and economic feasibility of complying with water quality standards. The "Water Quality Criteria," "Water Use Classifications," and "Policy Statements" of the Montana Water Pollution Control Council for streams and rivers in Montana have been included in Appendix I.

Sewage may be broadly categorized as either domestic or municipal waste, industrial waste, or animal and agricultural waste. Animal wastes are usually not involved in community sewage facilities; however, they do constitute a potential source of pollution which must be controlled and prevented from entering streams or other potential water supplies.

Although industrial activity throughout Montana has been limited, the need for control and treatment of industrial wastes is apparent. Industrial wastes vary in quantity and composition as greatly as the products and processes which generate them. They include toxic chemicals, solids carried in suspension, brines, strong acids and alkalies, oils, dyes, floating solids, and the heat generated by industrial processes. Industrial wastes are not found to be a major factor in the design of most community sewage facilities. Where economic projections indicate industrial development, the relationship to loading on domestic sewer systems is considered.

Domestic sewage is the primary consideration in this study and has been the basis for design and analysis. Where particular systems are subjected to loading from industrial sources, a more detailed study will be necessary. The general approaches outlined in "Analysis Criteria" in Appendix III will suffice in practically all cases.

BASIC CONSIDERATIONS

There are generally three main methods of sewage disposal. These are septic tanks, mechanical sewage treatment plants, and wastewater stabilization ponds. Local soil conditions, availability of land, and density of population are the basic factors which govern the selection of a particular method.

Many of the smaller communities have relied on individual septic tanks and cesspools for each home to handle sewage disposal. Septic tanks are suitable if the population density is low and if the systems are properly designed and maintained. Overflow from these tanks must drain into the soil and depending on local soil conditions may or may not create a problem. There is a limit to the amount of water that even loose granular soil can absorb. Density of population and the length of time the effluent has been entering the soil are factors which indicate whether septic tanks can be suitable for sewage disposal.

When economically feasible, community sewage collection and disposal systems are much more desirable than individual systems. Community systems eliminate the worry of septic tank failure, the danger of well contamination, and the problem of soil saturation. However, it is usually uneconomical to serve a few homes scattered over a large area with a community sewer system.

The type of sewage disposal facilities to be used can generally be determined on the basis of economic factors. Mechanical treatment plants provide an excellent means of sewage disposal although the initial cost, maintenance cost, and power cost are usually high. Wastewater stabilization ponds are an ideal method of sewage disposal and usually are the most economical to construct and maintain.

The Montana Water Pollution Control Council has established the criteria that treatment of domestic and industrial waste shall be secondary treatment or its equivalent. For domestic sewage, mechanical treatment plants, or stabilization ponds, when either is properly designed, constructed, and operated, meet these requirements.

A schedule for completion of secondary treatment facilities by communities across the state has been established by the State Department of Health. The target date is included for individual towns when applicable.

MINERAL COUNTY

Approximately sixteen hundred people, or fifty five percent, of the Mineral County population are presently served by community sewage facilities. By 1990 about 2,190, or sixty three percent of the population, will have access to community facilities if the proposed expansion program is followed. The remaining percentage will live in outlying areas, and the homes will not be close enough together to make community systems feasible.

SUPERIOR

Existing System. The 1970 population is estimated to be twelve hundred. A community sewer system facility is in existence, and the layout of this system is shown on Map 14. Construction of this system was completed in 1969, and the system is designed to serve eighteen hundred persons. Sewage treatment is accomplished by a forced air oxidation system built into a twin cell lagoon. The lagoon is approximately two acres in size and is located southwest of town. The collection system consists of ten inch diameter sewer main supplemented by several lift facilities. The new sewer system is considered to be more than adequate, and specific improvements are not comtemplated.

Improvements by 1990. By 1990 the population of Superior is expected to be thirteen hundred. The present sewer system facility is considered to be adequate for the needs of the town throughout the entire planning period. Minor additions to the collection system to serve growth areas and annual maintenance will be necessary to keep this system in satisfactory operating condition. No major expansion or enlargement will be necessary during the planning period.

ST. REGIS

Existing System. The 1970 population of St. Regis is estimated to be 475. Sewage disposal is handled by means of private septic tanks and cesspools. The soil in the area is quite gravelly, and drainage beyond septic tanks is good without construction of a drainfield. There are no pollution problems apparent, and only normal maintenance has been necessary with the individual septic tank and cesspool systems. Population projections indicate that the community will decline slightly throughout the planning period. The population is adequate to justify the construction of a central sewage collection and disposal system. The homes in the area are quite widespread and economic considerations will be a major factor in the design of a central system.

Improvements Next Five to Ten Years. The population is expected to be 460 by 1975. It is proposed that a central sewer system be constructed during this period. A five acre wastewater stabilization pond or a mechanical sewage treatment plant with the population equivalent of five hundred people could be constructed southeast of the community. Economic considerations and land acquisition possibilities will determine which of the treatment facilities is more feasible. Additional study would be necessary before a choice could be made. The proposed sewer system and service area are shown on Map 15.

Improvements by 1990. The 1990 population is expected to reach 440. The system proposed in the five to ten year period will be adequate to handle the needs of the community throughout this period. The only improvements which would be necessary during this period would be expansion to serve additional areas.

ALBERTON

Existing System. The 1970 population is estimated to be four hundred. A community sewer system facility was constructed in 1969, and the layout of this system is shown on Map 16. A collection system consisting of eight inch diameter sewer main, supplemented by a lift facility on the south edge of town, carries sewage to the treatment facility which is also located on the south edge of town. The treatment facility consists of a twin cell, two acre, aerated wastewater stabilization pond. The capacity of this system is more than adequate for the needs of this town throughout the planning period.

Improvements by 1990. The population is expected to decline to 380 by 1990. The present sewer system facility is considered to be adequate for the needs throughout the entire planning period. No major improvement or expansion will be necessary.

SALTESE

Existing System. The ninety persons who presently reside in this community use private septic tanks for sewage disposal. Extensive gravel layers below the ground surface provide excellent drainage for septic tank overflows. The present systems reportedly function satisfactorily, and improved sanitary facilities are not necessary at this time; however, the present population figures indicate that a central sewage system would be feasible. Population is expected to decline slightly over the twenty year planning period.

Improvements by 1990. The population is expected to be eighty by 1990. A community sewer system facility is feasible, and it is proposed that it be constructed during this period. Location of the proposed Interstate Highway 90, economic considerations concerning the complexity of a central system needed to serve the community, and problems with the individual sewage disposal systems will determine whether a system can be constructed. With the previous considerations in mind, a central sewage disposal system to serve the community is shown on Map 17. Sewage disposal would be handled by a series of gravity collection lines supplemented by a lift facility, and treatment would be accomplished by a one acre wastewater stabilization pond or a mechanical treatment plant with a population equivalent of one hundred persons.

DeBORGIA

Existing System. The sixty persons who presently reside in this community use private septic tanks with or without drainfields for sewage disposal. The soil in the area is quite gravelly and drainage is adequate. Individual sewage disposal systems have served this community adequately in the past and will continue to do so in the near future.

Improvements by 1990. The population is expected to decline to fifty by 1990. Individual systems may serve this community adequately during this period; however, if problems develop the population is sufficient to warrant construction of a central sewage disposal facility. A system which would serve the community adequately is shown on Map 18. Location of various facilities will depend upon economic considerations and the eventual location of Interstate Highway 90. A gravity collection system supplemented by a lift facility would carry sewage to the proposed one acre wastewater stabilization pond. An alternate treatment facility would be a mechanical plant with a population equivalent of one hundred persons.

MISSOULA COUNTY

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CONCLUSIONS, RECOMMENDATIONS, AND PRIORITIES

CONCLUSIONS

The total population of Missoula County is expected to increase substantially during the planning period. The majority of the communities in the county are expected to share in this growth, and rural population densities are also expected to increase.

Only the city of Missoula and the private community of Bonner currently offer their residents central water and sewer system facilities. The community of Seeley Lake offers its residents the service of a central water system. Minor expansion and improvements to the Seeley Lake water system are proposed for the planning period. Many other communities including the West Riverside-Pinegrove development, Lolo, Piltzville, Clinton, and Frenchtown are of sufficient size to warrant construction of central facilities. Both water and sewer systems for these communities are proposed and discussed in this report. Various possibilities for serving smaller rural communities are also discussed.

RECOMMENDATIONS

This plan shows the various types of improvements which the communities should be considering during the planning period. Elaborate systems are not proposed but rather those facilities necessary to provide safe and adequate community systems. It is recommended that this general plan be adopted by the governing agencies of each community. A detailed approach which must be undertaken to insure completion of the improvements in each community cannot be covered in a report of this type. Community leaders, however, do have several courses of action which may be taken.

Most small communities do not have the means to plan and finance complete water and sewer systems. Therefore, to enable communities to acquire such facilities, five departments of the Federal Government have legislation authorizing loans or grants for construction of public works. These agencies are:

Farmers Home Administration
United States Department of Agriculture
P. O. Box 850
Bozeman, Montana 59715

Federal Water Pollution Control Administration
United States Department of the Interior
% Montana State Department of Health
Helena, Montana 59601

Public Health Service
United States Department of Health,
Education, and Welfare
Division of Indian Health
Billings, Montana 59101

Administration for Metropolitan Development
United States Department of Housing and
Urban Development
Assistant Regional Administrator
Region VI Northwest Area Office
197 New Customs House
721 19th Street
Denver, Colorado 80904

Economic Development Administration
United States Department of Commerce
Montana Field Coordinator
207 Medical Arts Building
Butte, Montana 59701

The legislation is constantly changing; therefore, community leaders should investigate the various alternatives and determine which program and course of action would be most beneficial to them.

PRIORITIES

That a particular system requires immediate improvements and another system will be satisfactory for a definite period is difficult to establish. Several indicators for establishing priorities are available, however. The general health of the people is the prime consideration, and this can only be insured when safe water supplies are provided. Water supply in adequate quantities is another important factor. Waste water must be treated and disposed of by safe methods to minimize the problems of pollution and to protect public health. The total number of persons benefited by any improvement must also be considered. These basic criteria were used in establishing the following priority listing:

1. **Seeley Lake Sewer System.** The current problem of contamination of Seeley Lake due to sewage effluent from the community makes this project of top priority. Also, the number of persons who would benefit would include both the permanent residents of the community and the occupants of summer homes who utilize the lake for recreation purposes.

2. **Lolo Sewer System.** The reported problems of high ground-water table affecting sewage disposal and the evidence of some well contamination are of prime concern in this area. The existing problems and the projected population increases make the construction of this facility necessary and feasible.

3. **Piltzville Sewer System.** Current well contamination problems and projected population increases are factors in favor of building this facility.

4. **Clinton Sewer System.** Reported instances of well contamination and possible pollution of the Clark Fork make the construction of this project advisable in the near future. A substantial number of persons now and in the future would benefit from the completion of this project.

5. **West Riverside and Pinegrove Sewer System.** Although no serious problems have been reported to date, the present population figures and indicated population growth projections make the construction of a central sewage facility necessary. The possibility of a combined system to serve this community, Milltown, and Piltzville should be considered.

6. **Potomac Sewer System.** Although current problems are not intolerable, possible contamination of ground and surface water in this community should be eliminated. The number of persons who would benefit from this facility makes this project feasible.

7. **Frenchtown Sewer System.** The current population density of this community and the fact that large amounts of sewage effluent are being discharged into a relatively high, fast moving ground-water table indicate that this project should be planned and constructed.

8. **Potomac Water System.** Problems in obtaining water of satisfactory quality indicate that a project which would result in a safe water supply for the entire community would be of sufficient benefit to those concerned to warrant construction.

9. **West Riverside and Pinegrove Water System.** The number of persons who would benefit by the construction of a central water system make this proposed project feasible. The possibility of serving the entire strip rural development in this area by one central system should not be discounted.

10. **Lolo Water System.** Problems that have been encountered concerning contamination of shallow water wells and the possibility of utilizing an existing system for central water supply make this project necessary and feasible. Present population figures and population increase projections are reasons to warrant planning and construction of this project.

11. **Piltzville Water System.** Possible contamination of shallow domestic water wells at the present time makes the construction of a central water supply for the residents of this community a necessary project. As mentioned previously, the possibility of serving this community along with adjacent rural communities by a single central system instead of individual systems should be considered.

12. **Clinton Water System.** Shallow domestic water well contamination problems in this area warrant the construction of a central water system. The number of persons who would benefit by this improvement makes the proposed system feasible.

13. **Frenchtown Water System.** This facility is not immediately needed since most residents have developed rather good private wells. The system is feasible and should be constructed as sufficient demand develops.

14. **Seeley Lake Water System.** The proposed system improvements for this community are necessary to provide adequate water service to the projected increased population. Proposed improvements to the

system, however, will be of benefit at any time during the planning period.

15. Swan River Tracts Sewer System. The necessity of a system in this area will depend upon future construction and usage of seasonal facilities. This community is included as an example of what may be necessary to serve areas of high seasonal population densities.

16. Turah Sewer System. This community is included in this report as an example of what may be necessary to serve rural communities with stable year-long populations. The possibility of serving several of these communities with one large central system rather than building several small systems should be considered.

17. Swan River Tracts Water System. The proposed improvements would result in much better facilities being available to all the residents of this summer home community.

18. Turah Water System. This facility is not immediately necessary; however, if sufficient local demand develops, planning should begin for serving rural developments in this area with individual water systems or one central water system.

This list of priorities is not intended to govern the order in which action should be taken. The order merely ranks the severity of the problems and the need for improvements.

THE LAND

GENERAL CHARACTERISTICS

Missoula County, situated near the center of the border on the western edge of the State of Montana, is bounded by Ravalli, Granite, Powell, Lake, Sanders, and Mineral Counties and the State of Idaho. The county's total area is 2,625 square miles of which water surface makes up eleven square miles.

As seen on Map 1, the topography of the county is very mountainous, and well over twenty five miles of the southwestern county boundary lie along the summit of the Bitterroot Divide. Besides being mountainous, the county is well marked by valleys. Elevations range from Lolo Peak, which reaches an elevation of 9,075 feet above sea level, to about four thousand feet where the Clark Fork leaves the county. The largest concentration of population is in Missoula which has grown and prospered from a small lumber milling town to the largest city in the county. Missoula is the regional market center for the surrounding areas and offers many shopping, educational, recreational, and industrial opportunities. However, because its population exceeds the limit of this study, Missoula has been excluded from this plan.

The county is served by numerous highways and roads. U. S. Highway 10-12, which is also Interstate 90 and a controlled access highway, travels through the center of the county and the City of Missoula and eventually leads to Coeur d'Alene, Idaho. This highway is the main transportation route for the county while other state highways such as 12 and 93 travel from Ravalli County to Lolo and on to Missoula. Other principal through roadways such as State and Provincial Highway 200 travel from Missoula to Great Falls. All other roadways are not considered principal highways and serve the smaller outlying towns and rural areas.

Since 1881 the Northern Pacific Railroad, now the Burlington-Northern, has been serving Missoula and the surrounding area of the county. Today Missoula is the main hub station for this line and provides service with easy access to all communities in the county. The Burlington-Northern follows the Clark Fork northwest from Butte and, passing through Missoula, continues on to Superior and eventually leads into Idaho. Passenger service is provided daily by the North Coast Limited and the Mainstreeter passenger trains between Butte and Missoula. A continually changing number of freight trains move over the entire county route daily. A branch line of the Burlington-Northern leads south from Missoula and eventually terminates at Darby in Ravalli County. Another line also branches off from the main line northwest of Missoula and leads up to Polson on Flathead Lake. The electrically powered Chicago, Milwaukee, St. Paul, and Pacific Railroad also provides freight car service to Missoula County along a route parallel to that of the Burlington-Northern. A branch of the Chicago, Milwaukee, St. Paul, and Pacific extends northeastward from Missoula and eventually terminates at the community of Cottonwood in Powell County.

Because of the rough topography of the county, airfields are limited. A commercial airport with complete aircraft servicing facilities and connections to nation wide airlines is located in Missoula.

Missoula County is the location of a major power generation and distribution center. The Montana Power Company has both a generating station and major switching and substations located at Missoula. Montana Power transmits most of the power in the county to local distribution points such as those at Lolo and Huson. Much of the power actually comes from Bonneville Power Administration facilities. Local distribution throughout the county is accomplished by the Missoula Electric Co-operative, Incorporated.

Since major power producing centers and relay stations are usually located at widely separated points and provide power service to large areas, Map 2 shows the major power grid system for the entire State of Montana. Major gas transmission lines are also shown.

One telephone company and one telephone cooperative serve the county. The Mountain States Telephone Company serves all areas of Missoula and surrounding communities with the exception of the southeast corner of the county which is served by the Blackfoot Telephone Cooperative.

LAND OWNERSHIP AND USE

As indicated on Chart 1, the largest percentage of the county area, forty six percent or 1,210 square miles, is privately owned. The Flathead Indian Reservation makes up six percent, 147 square miles, of the land. Federal ownership is forty four percent, 1,167 square miles, while the State of Montana holds four percent, 101 square miles.

Missoula County is chiefly an agricultural and recreational area. Much of the county is located in the Bitterroot Mountain Range and, consequently, about eighty seven percent of the land is covered by forests. Only forty percent of the county, 1,047 square miles, however, lies in the public lands of Lolo and Flathead National Forests. The remaining timber areas are on private farms and ranches which take up 1,496 square miles, or fifty seven percent of the county. The remaining county area is used miscellaneously for such purposes as townsites and transportation routes; the eleven square miles of water surface area are included in this category. Land use is indicated on Chart 2.

Sometime after 1865 gold was discovered on Elk Creek in eastern Missoula County. Placer gold production was almost continuous from this area until 1948. In 1964 sand and gravel, stone, barite, lime, zinc, silver, lead, copper, and gold, in order of economic importance, were mined in the county. The total revenues from mineral resources for that year was nearly two million dollars. By 1967 the list of economically important minerals had dwindled to sand, gravel, and stone, and the revenues had decreased $640,000. As indicated, the mining of gold, silver, lead, copper, and zinc is almost at a standstill; however, some mines of this type such as the Hidden Treasure Cape Nome, Ward Lode, and Waldbillig mines are currently in the development and partial exploration stages.

Several barite veins occur in the county, but since 1966 when the Baroid Division, National Lead Company grinding plant at Greenough closed down, mining has also ceased.

The McQuarrie Quarry, owned by the Burlington-Northern Railroad at Missoula, is currently producing stone for railroad ballast and road metal.

Pumicite, a volcanic ash used in abrasives, clay, and coal also occurs in the county but active production is not presently in operation.

As previously indicated, eighty seven percent of the county is covered by forests, an important economic resource of the area. Total timber industry receipts in the national forest areas totaled $1,561,922.56 in fiscal year 1969. The Waldorf-Hoerner Paper Products Company operates a pulp mill west of Missoula and the Vancouver Plywood Company operates a plant also at Missoula.

Recreation opportunities are another natural resource of an area, and Missoula County offers an impressive array of outdoor recreations. The Clark Fork and Blackfoot and Bitterroot Rivers provide fine trout fishing in the summer months and whitefish fishing in the wintertime. Whitetail and mule deer, moose, elk, grizzly and black bear, and mountain goat challenge the big game hunters. The county is also the home of game birds such as ring necked and Hungarian pheasant, mountain grouse, and many waterfowl species.

Careful land management should promote the recreation potential of the county and keep the county visitor an important economic factor.

SOILS

The soils of the county range from relatively barren alpine types to rich fertile soils found in the sediment filled valleys of the area. The majority of the soils support forests.

Soils are covered in more detail later in this report.

WATER

Several rivers and many small streams and lakes make up the county. The major drainage is the Clark Fork and its tributaries which drain the area generally eastward.

Both surface and ground-water resources are covered in more detail later in this report.

CHART 1

Land Ownership

Missoula County

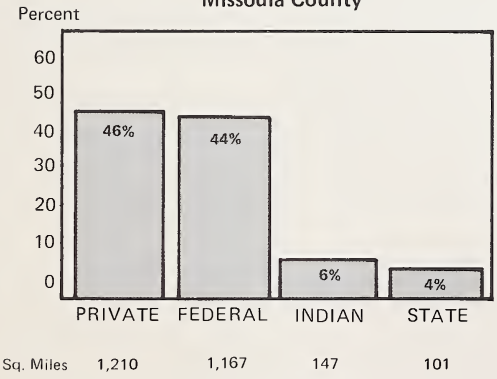
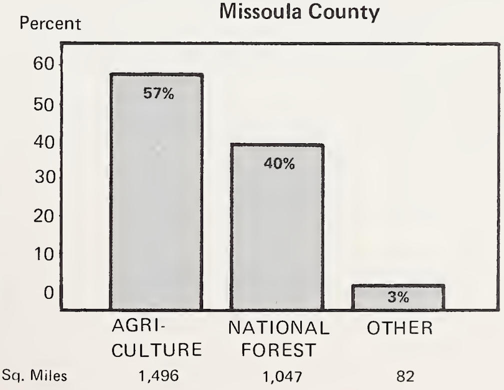


CHART 2

Land Use

Missoula County



Sources: 1. The Montana Almanac 1959-60, 1962-63
2. Forest Service, U. S. Department of Agriculture
3. U. S. Census of Agriculture, 1964
4. Bureau of Indian Affairs, U. S. Department of Interior

THE PEOPLE

POPULATION

For analytical and projective purposes, it is necessary to study the population history of Missoula County to find out what has happened and what is expected to happen in the future. Chart 3 graphically shows the growth of the county as compared with that for Montana and indicates the future growth for both.

Between 1920 and 1930, population declined by almost ten percent, but since 1930 substantial increases have been recorded. During the past thirty years the rate of growth in the county has been noticeably higher than for the state and is expected to continue throughout the twenty year planning period. The majority of the growth has occurred in Missoula which, because of its size, lies outside the scope of this study. Missoula will continue to be the major growth area through 1990.

In 1960 the county was classified as urban having a major aggregate of urban population. Table 1 indicates that since 1950 the urban population increased every ten years for an average of almost twenty nine percent as compared to almost twenty eight percent for the total county. The rural population grew an average of twenty five percent for each ten year period. The rural growth has occurred among the non farm population while the number on farms has dwindled.

From 1950 to 1960 the population in the county increased by 9,170 persons. Chart 4 indicates that three fourths of the gain resulted from the excess of births over deaths. Migration accounted for the remainder of the increase.

The change in sex composition from 1950 to 1960 is shown in Chart 5. The number of both sexes remained fairly even with a slight preponderance of males over females in both years. The 1960 ratio should remain constant. The age distribution by sex for 1950 and 1960 is shown in Table 2. Generally, all age groups increased in numbers over the ten year period.

A total of eleven communities were studied. The list includes Clinton, Frenchtown, Huson, Lolo, Lolo Hot Springs, Piltzville, Potomac, Swan River Tracts, Seeley Lake, Turah, and West Riverside. The communities of Condon and Greenough were surveyed but were not included because they lacked sufficient development and population. Bonner and Milltown were studied but excluded since they are self contained company towns. The urban areas located east and southwest of the City of Missoula are part of the integral urban area and as such were also not included within this study.

Throughout the planning period West Riverside will remain the largest community covered in the report. The population will increase to eleven hundred, or 220 more than the present 880. Growth will occur within the boundaries of the existing developed area.

Seeley Lake will grow by fifty six percent over the next twenty years for a population of one thousand. New developments will spring up east of the lake to accommodate the population increase.

A forty percent increase in population is forecasted for Lolo by 1990. New development should occur northerly of the community.

Growth for the remaining communities will be minimal. New development will be on a small scale and can be accommodated within the existing communities.

The population figures reflect only those factors and trends for which there is available information. New technological advances, new industries, or other unforeseen action may alter the population of these forecasts. If such an event occurs, the areas affected should be re-examined in light of the new conditions.

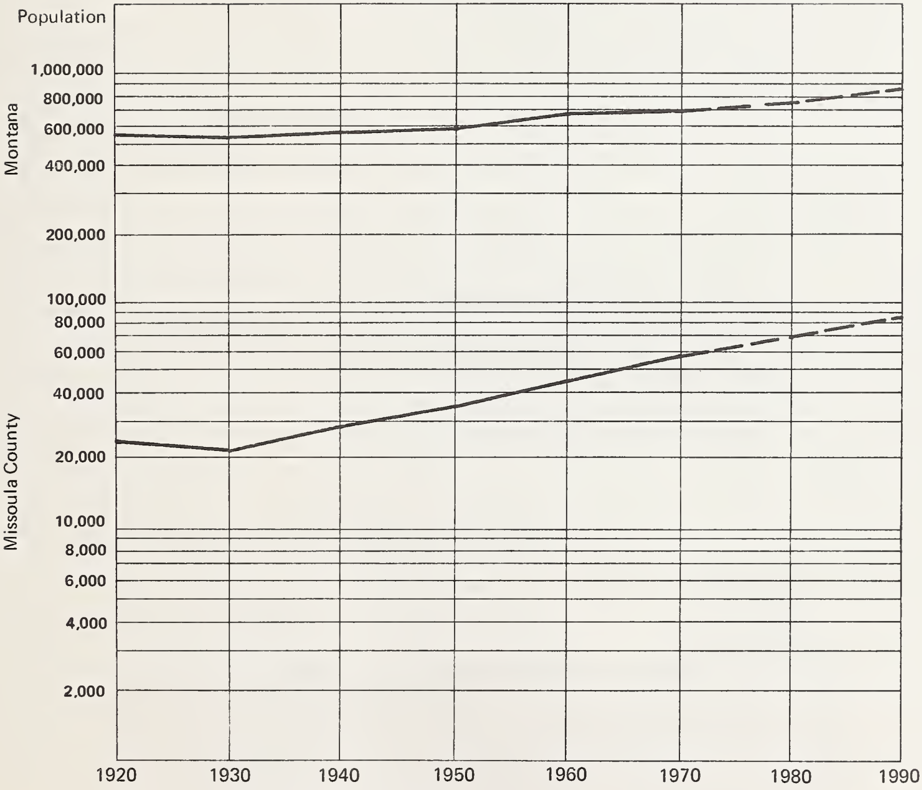
HOUSING

In 1960 there were 15,232 housing units in Missoula County. Chart 6 indicates that only three percent were represented by farm units and twenty eight percent were classified as rural non farm. The remaining housing units were in urban areas. The median housing unit size was 4.30 rooms per unit and the median household size per occupied unit was 3.17 persons. Of those units, slightly more than half were owner occupied while one third

CHART 3

Comparative Population Trends

Missoula County and Montana 1920-1990

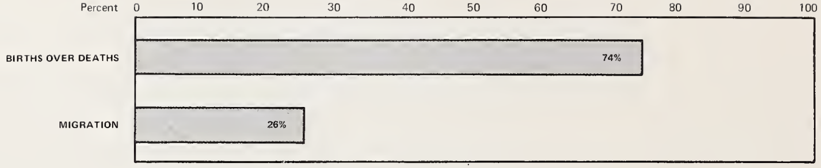


Sources: 1. U. S. Census of Population
2. Intermountain Planners, Inc.

CHART 4

Population Gain

Missoula County 1950-1960

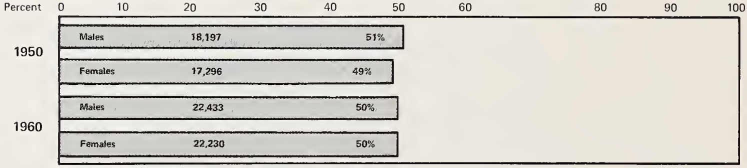


Source. Net Migration of Population, 1950-60 by Age, Sex and Color,
U. S. Department of Agriculture

CHART 5

Population by Sex

Missoula County 1950-1960



Source: U. S. Census of Population

Housing

Missoula County 1960

CHART 6

Housing Classification

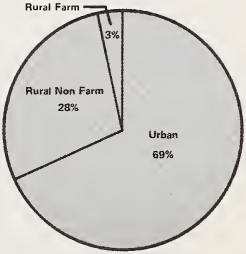


CHART 7

Housing Tenure

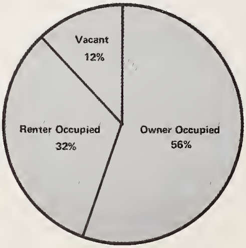
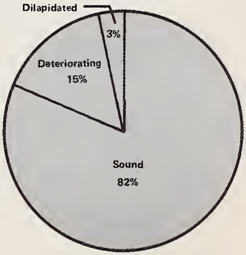


CHART 8

Housing Condition



Source: U. S. Census of Housing, 1960

were used for rental purposes. Chart 7 indicates that twelve percent were vacant. The condition of housing in 1960 is reflected in Chart 8 which indicates that only three percent were in need of replacement while fifteen percent needed repair. The remainder were classified as sound.

Chart 9 reflects the 1960 status of housing units in terms of the source of water, water supply, and method of sewage disposal. For geographical reference, the data shows the status for the county and for the urban, rural non farm, and farm areas.

In 1960 more than three out of every four homes in the county were served by a public water system or by a private company. Those served included almost all homes in the urban areas, one third of the rural non farm homes, and only one percent of the farms. The urban homes recorded a high percent of those served because of the inclusion of statistics for homes in the Missoula area. The rural non farm homes and the farms were generally served by individual wells. Almost one fifth of the homes in both categories did, however, resort to some other source for water in 1960.

Almost all homes had piped water in 1960. Only four percent of the total homes did not report this accommodation in the United States Census of Housing. The list of homes without piped water included one percent in the urban areas, eleven percent of the rural non farm homes, and six percent of all farms.

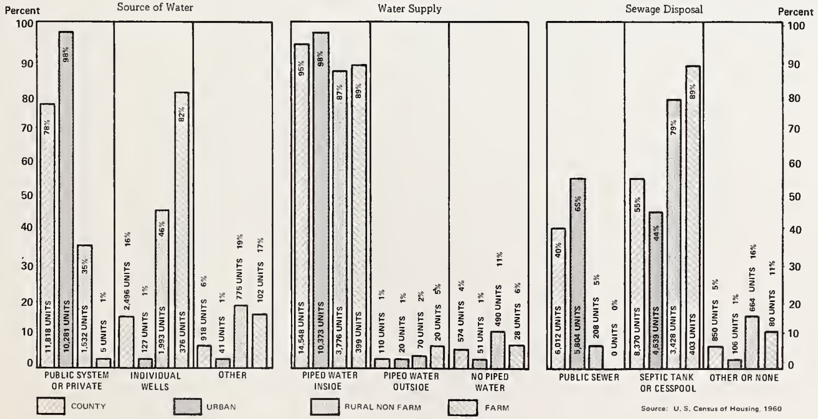
Generally, sewage disposal was handled by septic tanks or cesspools in 1960. Only forty percent of all homes were served by a public sewer and five percent used some other method.

Slightly more than half of the urban homes were served by a public sewer. The remainder of homes in the urban areas utilized either septic tanks or cesspools. Homes, both of the rural non farm and farm types, generally used septic tanks or cesspools for sewage disposal in 1960. Only sixteen percent of the rural non farm and eleven percent of the farms, as indicated in Chart 9, used some other method.

CHART 9

Water and Sewer

Missoula County 1960



Source: U. S. Census of Housing, 1960

TABLE 1

Urban-Rural Population Changes for Missoula County 1950-1970

	1950	1960	Changes Number	1950-1960 Percent	1960	1970	Changes Number	1960-1970 Percent
Total	35,493	44,663	+9,170	+25.8	44,663	58,000	+13,337	+29.9
Urban (Inc. Towns)	25,919	32,926	+7,007	+27.0	32,926	43,000	+10,074	+30.6
Rural	9,574	11,737	+2,163	+22.6	11,737	15,000	+ 3,263	+27.8
Farm	2,970	1,551	- 1,419	- 47.8	1,551	1,000	- 551	- 35.5
Non Farm	6,604	10,186	+3,582	+54.2	10,186	14,000	+ 3,814	+37.4

Sources: 1. U. S. Census of Population
2. Intermountain Planners, Inc.

TABLE 2

Age & Sex Composition of Missoula County

	1950		1960	
Age Group	Male	Female	Male	Female
Under 5	1,982	1,952	2,622	2,609
5-14	2,727	2,631	4,472	4,404
15-19	1,262	1,373	1,956	1,973
20-24	1,972	1,679	1,900	1,721
25-34	2,885	2,701	2,838	2,729
35-44	2,277	2,189	2,690	2,684
45-54	1,805	1,838	2,366	2,286
55-64	1,650	1,577	1,637	1,683
65-74	1,128	948	1,291	1,378
75 +	509	408	661	763
Total	18,197	17,296	22,433	22,230

Source: U. S. Census of Population

TABLE 3

Population Forecast for Towns and Communities Missoula County

	1950	1960	1970	1975	1980	1990
Clinton	50	160	220	230	240	270
Frenchtown	100	100	150	155	160	175
Huson	30	5	10	10	10	9
Lolo	200	100	500	550	600	700
Lolo Hot Springs	25	10	10	8	7	10
Piltzville		235	270	285	300	350
Potomac	80	30	50	60	75	80
Seeley Lake	10	500	640	700	800	1,000
Swan River Tracts	NA*	NA*	30	30	30	25
Turah	NA*	NA*	65	60	50	40
West Riverside	NA*	NA*	880	920	950	1,100

Sources: 1. U. S. Census of Population * Not Available
2. Intermountain Planners, Inc.

THE ECONOMY

LABOR

People have a direct relationship on the economy of an area because of their role as both producers and consumers of goods and services. The following economic analysis of Missoula County is concerned primarily with the total economic spectrum and how it may affect the future. Changing economic conditions can have either a good or a bad effect on an area in terms of population growth, ability to provide for public improvements, or in determining the general overall living environment.

Missoula County recorded a twenty five percent employment gain between 1950 and 1960. The increase is contrasted with a six percent gain for Montana in the same period.

The past employment change by major industry groups is shown in Chart 10. With the exception of the agriculture and mining groups, all other segments of the economy experienced an increase over the ten year period. It should be mentioned that the majority of all economic activities are centered in the Missoula area which has been excluded from the scope of this report.

The services and finance industry group represented the largest segment of the labor market in 1960. Almost one third of those employed in that group were in the educational field. This is understandable since the University of Montana and the large school district of Missoula are both located within the county. Thirty nine percent of the services and finance group were equally represented by hospital workers, persons engaged in personal services, and those engaged in finance, insurance, and real estate fields. The percentages of those categories were high because of the regional center represented by Missoula.

The trade industry represented a major segment of the labor force in 1960, again because of the regional role played by Missoula. Over half of the trade group was represented by the retail segment of the labor force, and about one third were engaged in eating and drinking establishments. Wholesale trade represented the remaining sixteen percent of the industry group.

The manufacturing industry group represented a larger percent of the total labor force in the county than that noted for Montana. Almost two out of three persons in that group in 1960 were engaged in the manufacturing of furniture and other lumber and wood products. The strength of this group is closely allied with that of the forestry and fisheries industry because of the impact of the area's forests. Food product manufacturers attracted sixteen percent of the manufacturing group labor force during the same period.

The small number of persons engaged in the agriculture industry group is understandable; the forests and the topography prohibit major accumulations of usable lands for farming operations of any size.

The percentages for employment by industry group, as shown in Table 4, give an insight into local employment characteristics. The table shows the relative weight of each industry group in the county and offers a comparison with that existing in 1960 for the State of Montana and the United States.

The services and finance industry group attracted the largest percent of the labor force in 1960. One third of all the labor force was engaged in that group as opposed to twenty six percent for the state and sixteen percent for the nation.

The trade industry group represented the next largest classification of employment in the county. That group represented twenty one percent of the total labor force, a figure equal to that for the state and slightly higher than that for the nation.

The available labor statistics for 1969 indicate a further growth in the labor force. For example, the manufacturing industry group grew forty two percent and the trade industry group experienced an employment gain of ten percent over that reported for 1960.

As mentioned, the Missoula area accounts for a major portion of the labor force in the county. It is expected that future employment growth will be centered mainly in that area with a nominal growth occurring in other parts of the county. As a result, population growth in areas covered by this report will continue as in the past.

AGRICULTURE

A farm is defined by the United States Census as a place having at least ten acres of land devoted to agriculture and selling at least fifty dollars worth of agricultural products annually. According to Chart 11, there were 431 farms in Missoula County in the above category in 1964, or fifteen percent fewer than there were in 1959.

The 1964 classification of farms by type was as follows:

Field crop farms other than vegetables, nuts, and fruit		22
Cash grain	9	
Other field crops	13	
Vegetable farms		3
Fruit and nut farms		1
Poultry farms		4
Dairy farms		11
Livestock farms other than poultry and dairy		133
General farms		32
Miscellaneous and unclassified		225
Total		431

Of the total number of farms, 164 were classified as part time and forty five were classified as being operated by semi retired persons.

The farm picture suggests a number of gentlemen farmers owning farms of less than average size for the county. In 1964 the average size farm was 902 acres. Chart 12 indicates that over half of all farms were under 260 acres while only twenty nine percent were over five hundred acres in size. In that year about one third of all farms were classified as livestock producers, and almost half were operated by semi retired persons or on a part time basis.

The value of products sold by the number of farms further indicates that the gentleman farmer is common in Missoula County. As seen in Chart 13, seventy percent of all farms received under $5,000 for products sold. At the same time only one farm in five received in excess of $10,000.

The cash receipts data for the county from 1964 to 1967 is as follows:

Year	Livestock	Crops	Total
1964	$1,890,100	$1,018,200	$2,908,300
1965	$2,113,100	$ 939,800	$3,052,900
1966	$2,831,200	$ 850,700	$3,681,900
1967	$2,883,200	$ 855,100	$3,738,300

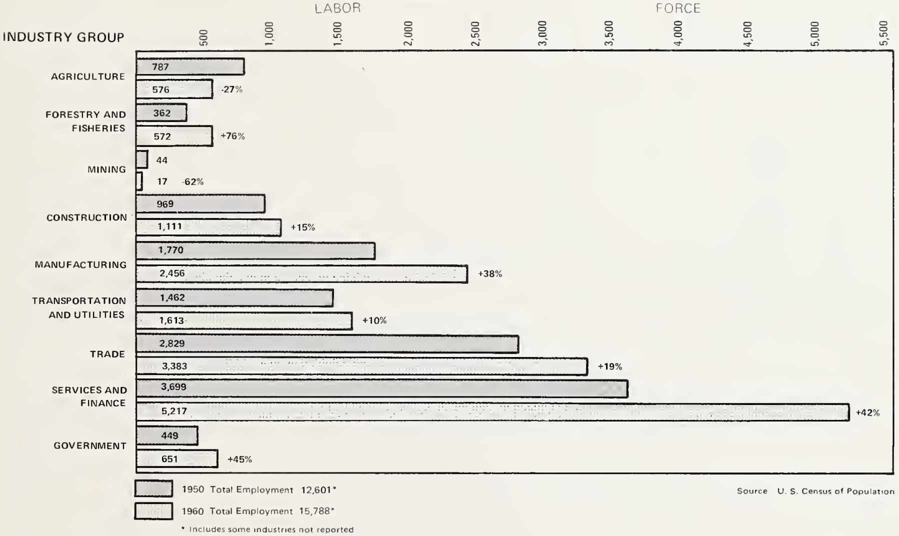
In 1964 the sale of livestock products represented about two thirds of all agricultural products sold. Throughout the four year reporting period the ratio of livestock to crop sales increased by nineteen percent. The sale of livestock represented seventy seven percent of all cash received.

Agriculture will probably continue as in the past resulting in fewer but larger livestock farms.

CHART 10

Employment Change by Major Industry Group

Missoula County 1950-1960

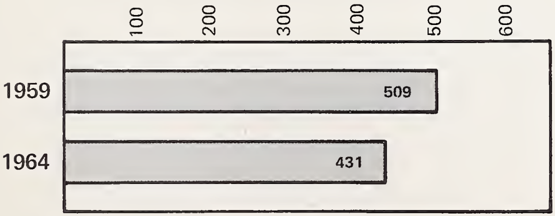


Source U. S. Census of Population

CHART 11

Number of Farms

Missoula County 1959-1964



Source: U. S. Census of Agriculture, 1964

CHART 12

Farms by Size

Missoula County 1964

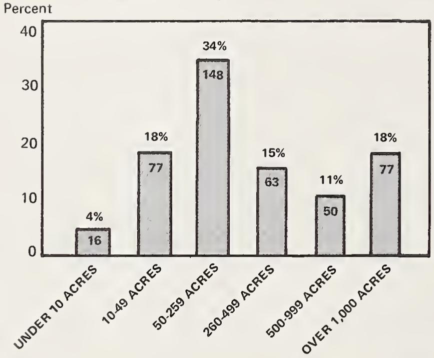
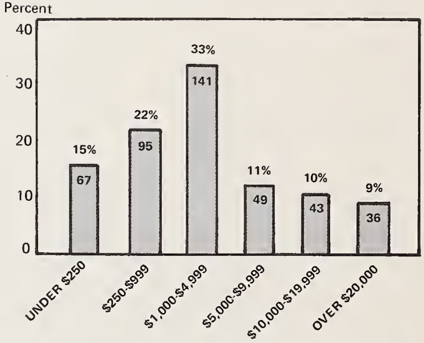


CHART 13

Number of Farms by Value of Farm Products Sold

Missoula County 1964



Source: U. S. Census of Agriculture

TABLE 4

Percent of Total Employment by Industry Groups

Missoula County, Montana and United States 1960

	Missoula County	Montana	United States
Agriculture	4	17	11
Forestry and Fisheries	4	1	1
Mining	1	3	1
Construction	7	7	5
Manufacturing	16	10	27
Transportation and Utilities	10	9	7
Trade	21	21	19
Service and Finance	33	26	16
Government	4	6	13
Total	100	100	100

Source: U. S. Census of Population, 1960

THE GOVERNMENT

Before any meaningful consideration can be given to major capital improvement projects, it is necessary to study the governmental organizations in Missoula County and to analyze their economic structure. At present there is only the county government involved within the scope of this water and sewer study. The City of Missoula due to its large size has been excluded. A Board of County commissioners presided over by a chairman governs the county.

In financing capital improvement projects, the incorporated municipalities have power to bond and raise the necessary monies for funding projects. The unincorporated small towns do not have similar power and, therefore, must rely on revenues of the county government.

In fiscal year 1969 the county revenue and expenditures figures were $2,774,570.41 and $2,890,890.92 respectively. The assessed valuation of county property was $183,125,616.00.

There are several methods presently available to communities for financing water and sewer systems. Incorporated cities and towns may use municipal bonds, municipal revenue bonds, and Special Improvement District bonds. Unincorporated towns, on the other hand, may use Rural Special Improvement District bonds and County Water and Sewer District bonds. Incorporated cities and towns and adjacent unincorporated areas may also use Metropolitan Sewer District bonds.

THE WATER RESOURCES

GENERAL

The water resources of any area are one of its most important assets. Montana is fortunate in that water is in abundant supply over much of the state. This is especially true in the mountain areas and along the major river drainages. Water is essential for many human needs with individual consumption and sanitation being foremost. Industrial and agricultural uses of water are perhaps next most important. The recreational use of water has also become a significant factor in modern day living.

In his use of this resource, man in the past has polluted much of the available fresh water and degraded it to the point where it is unfit for many or all uses. Careful planning for the efficient use of water resources can help to avert inconveniences caused by pollution.

Water resources, therefore, are an important consideration in the comprehensive planning for community water and sewer systems. In the following portion of this report, the existing water resources of the planning area will be briefly reviewed. The discussion will be specifically concerned with the occurrence and availability of both surface and ground water. Also important, and included in Appendix I are the specific laws and policies of the State of Montana concerning surface and groundwater resources. "Water Quality Criteria," "Water Use Classifications," and "Policy Statements" adopted by the State Department of Health are discussed in detail. Table A in Appendix I outlines present day water quality standards as set forth by the United States Public Health Service.

SURFACE-WATER RESOURCES

Missoula County surface-water characteristics are typical of those found in mountainous terrain. The majority of the county consists of mountainous topography with portions of at least six mountain ranges predominating. The ranges represented are the Bitterroot, Coeur d'Alene, Mission, Swan, Garnet, and Sapphire. The county is also heavily timbered with portions of the Clark Fork Valley, Bitterroot Valley, and Blackfoot Valley being the major timber free areas.

TABLE 5

Stream Gaging Station

Stream	Gaging Sta. Location	Drainage Area (sq mi)	See Notes	Discharge (cfs)						Runoff - (1,000 Acre-Ft)			
				Max.	Date	Min.	Date	Average	Years Averaged	Max.	Date	Min.	Date
1. Clearwater River	At Clearwater	391	1,2	2,400	5/26/22	30	11/21/22	*	*	*	*	*	*
2. Blackfoot River	At Clearwater	1,550	1,2	7,820	6/ 6/22	410	11/21/22	*	*	*	*	*	*
3. Blackfoot River	Near Potomac	*	1	10,900	6/15/59	300	1/ 4/58	*	*	*	*	*	*
4. Blackfoot River	Near Bonner	2,290	1,2	18,300	6/ 4/53	200	1/ 4/50	1,605	23	1,600	1951	403.9	1941
5. Clark Fork River	3 mi. downstream from Blackfoot R.	5,999	1	31,500	5/23/48	115	10/25/43	2,815	30	3,084	1951	973.2	1941
6. Rattlesnake Creek	At Missoula	79.7	1,2	2,050	6/18/99	3.2	8/30/58	*	*	*	*	*	*
7. Lolo Creek	Near Lolo	231	1,2	2,500	5/28/13	33	12/26/11	*	*	*	*	*	*
8. Lolo Creek	4 mi. upstream from mouth	250	1	2,430	5/24/56	6.3	11/ 9/52	218	8	220.8	1956	108.6	1953
9. Bitterroot River	Near Missoula	2,812	1,2	28,300	6/20/99	370	9/29/04	*	*	*	*	*	*
10. Clark Fork River	2 mi. down from mouth of Bitterroot River	9,003	1	52,800	5/23/48	388	1/18/33	5,164	30	6,065	1948	1,869	1937

Source: "Water Resources Survey Missoula County, Montana," Montana Water Resources Board, Helena, Montana, 1960

Notes:
1. Irrigation diversions occur above these stations
2. Only short term or seasonal records available

* Not recorded

The wide variation in elevations add to the complex surface drainage system. Elevations in excess of ten thousand feet above sea level occur among the high peaks; whereas, an elevation near three thousand feet occurs along the Clark Fork as it leaves the county west of Missoula.

The Clark Fork is the major drainage feature of Missoula County. The river enters the county southeast of Clinton and flows northwest through the county before entering Mineral County near Alberton. The Clark Fork is an important tributary of the Upper Columbia River.

Other important streams in the drainage system are the Bitterroot River and the Blackfoot River. The Bitterroot River enters Missoula County south of Lolo and flows north to its confluence with the Clark Fork at Missoula. The Blackfoot River enters the county near Cottonwood on the Missoula Powell County line and flows southwest to its confluence with the Clark Fork at Milltown. An important tributary of the Blackfoot is the Clearwater River which flows southeast from Seeley Lake to its confluence with the Blackfoot near Greenough.

The streams provide a yearlong source of water for irrigation, livestock, and municipal needs. Many of these streams have gaging stations installed by the United States Geological Survey where flow measurements are taken and recorded at regular intervals. Table 5 includes available data on the drainage area, discharge, and runoff for each gaging station pertinent to Missoula County.

The climate characteristics are similar to those of Pacific Coast Regions. Within the county are wide variations in climate due to the extremes of topography. In general, however, the winters are not severe and the precipitation averages are higher than those of counties in Montana east of the Continental Divide.

The effect that topography has on the climate is very important to the water resources. Prevailing west to southwest winds flowing across the high mountains provide the highest annual precipitation values. Precipitation totals decrease with decreasing elevation throughout the county. As an example of the effect of topographic conditions, a precipitation measuring station near Missoula recorded a twenty nine year average annual total of 12.56 inches. A station at Seeley Lake recorded a nineteen year average of 20.54 inches, and one at Upper Holland Lake in extreme northeastern Missoula County recorded a nine year average of 64.46 inches.

Much of the precipitation during the winter months occurs as snowfall, and the resulting heavy snowpack produced in the high mountains each year contributes significantly to the water resources. Snow begins to accumulate in November in the higher mountain valleys and continues to build up until late March or early April. Portions of the high mountain snowpack remain until well into the warm summer months. The runoff from the snowpack at this time of the year enables reservoirs to be filled and periods of high demand satisfied.

The use of surface water is widespread for domestic, industrial, agricultural, and recreational purposes. The community of Seeley Lake uses water from Seeley Lake for its municipal supply, and the City of Missoula uses water from Rattlesnake Creek for a portion of its supply. As shown in Table 6, the chemical analysis of the water from the Rattlesnake Creek supply compares favorably with the analyses for the various Missoula ground-water supplies. Several thousand acres are currently being irrigated under present facilities and a potential exists for more development. Industrial uses vary considerably; however, uses involving the lumber industry predominate. A final but important use of surface water is for recreational purposes.

WATER USE CLASSIFICATIONS

The Water Pollution Control Council has classified the streams and drainages in Montana according to the water use classification definitions shown in Appendix I. The streams and drainages of Missoula County and surrounding areas are classified as follows:

Clark Fork River Drainage from the Little Blackfoot River to the Idaho line except those portions of tributaries listed below:	B-D$_1$
Georgetown Lake and tributaries above Georgetown Dam	A-Open-D$_1$
Flint Creek Drainage from Georgetown Dam to the Farm-to-Market Highway No. 348 bridge about one mile west of Philipsburg except those portions of tributaries listed below:	B-D$_1$
Fred Burr Lake and headwaters from source to the outlet of the lake	A-Closed
Flint Creek (mainstem) from Farm-to-Market Highway No. 348 bridge about one mile west of Philipsburg to the Clark Fork River	B-D$_2$
South Boulder Creek Drainage to the Philipsburg water supply intake	A-Open-D$_1$
Remainder of South Boulder Drainage	B-D$_1$
All other tributaries to Flint Creek from Farm-to-Market Highway 348 bridge to the Clark Fork River	B-D$_1$
Rattlesnake Drainage to the Missoula water supply intake	A-Closed
Remainder of Rattlesnake Drainage	B-D$_1$
Packer and Silver Creek Drainage (tributaries to the St. Regis River) to the Saltese water supply intakes	A-Open-D$_1$
Remainder of Packer and Silver Creek Drainages	B-D$_1$
Ashley Creek Drainage to the Thompson Falls water supply intake	A-Closed
Remainder of Ashley Creek Drainage	B-D$_1$
Pilgrim Creek Drainage to the Noxon water supply intake	A-Open-D$_1$
Remainder of Pilgrim Creek Drainage	B-D$_1$
All tributaries of Clark Fork River not otherwise mentioned including Swan River Drainage (except Swan Lake proper)	B-D$_1$

GROUND-WATER RESOURCES

Ground water is widely used in Missoula County for domestic purposes and to a lesser extent for livestock and irrigation. As of January 1970, there were 1,597 well and 382 spring appropriations on file with the Montana Bureau of Mines and Geology. The majority of the appropriations are in the Missoula Valley and along the Clearwater, Swan, Blackfoot, and Clark Fork Rivers.

With an area of 2,624 square miles in Missoula County, there is more than one ground-water appropriation per square mile. A total of 1,199 wells are used for domestic purposes, seventy one for irrigation, thirty nine for industry, fifty one for public supply, nineteen for livestock, 167 for a combination of stock and domestic purposes, and fifty one for other assorted use. Of the springs, forty eight are used for domestic purposes, seventy six for irrigation, 120 for livestock, twenty three for a combination of livestock and domestic purposes, and six for commercial use. Use of 109 springs is not reported. The communities of Missoula and Milltown have appropriated ground water for municipal use. Private wells are widely used in other communities in the county. There are several reports that describe the geology of parts of Missoula County. There are two technical reports that describe ground-water resources of parts of Missoula County. These are (1) McMurtrey, R. G., Konizeski, R. L., and Brietkrietz, Alex, 1965, Geology and ground-water resources of the Missoula Basin, Montana: Montana Bureau of Mines and Geology Bulletin 47, and (2) Perry, E. S., 1933, Shallow wells as a source of irrigation water in Frenchtown and Camas Prairie Valleys, Montana: Montana Bureau of Mines and Geology Misc. Contr. 5.

TABLE 6

Chemical Analysis of Municipal Water Supplies

(All Figures in Milligrams per Liter)*

City or Town	Missoula	Missoula	Missoula	Missoula	Missoula	Seeley Lake
Source	Rattlesnake Creek	Russell Street Well	Well F	South Avenue Well	Schilling Street Well	Seeley Lake
Date	8/64	1/67	7/55	7/55	7/55	7/68
Total Solids	38	230	185	41	205	66
Hardness	31	182	204	60	210	150
Ca	8	38	44	10	48	14
Mg	3	21	23	9	23	28
Na+K	0	21	12	7	3	—
CO_3	0	0	0	0	0	0
HCO_3	36	220	153	43	175	61
SO_4	1	29	34	5	43	1
Cl	0	8	3	3	3	4
NO_3	0.0	12.0	4.4	0	4.4	0
F	0.0	0.1	0.15	0.1	0.15	0.2
Fe	0.00	0.00	0.04	0	0	0.4
As	0.00	0.00	—	—	—	0.00
Pb	0.00	0.034	—	—	—	0.00
Cu	0.10	0.38	—	—	—	0.05
Zn	—	—	—	—	—	—

* See Appendix I, Table A, for accepted water quality standards

Source: State Department of Health, Helena, Montana

A wide variety of rocks ranging in age from Precambrian (greater than 600 million years old) of Recent (less than twenty thousand years old) are present in Missoula County. Geological conditions in the county influence the occurrence and availability of ground water. The geologic history of Missoula County includes long periods of sedimentation during Precambrian through Mesozoic time; uplift and structural deformation of the area occurred during Cretaceous time, followed by long periods of erosion and some structural deformation. Glaciation during the Pleistocene epoch influenced the Missoula Valley area due to formation of a large glacial lake and subsequent sedimentation in the lake. After glaciation, major streams in the area through erosion of older deposits formed new alluvial deposits. Unconsolidated Pleistocene and Recent sediments are the most important acquifers in the county.

The oldest rocks exposed in Missoula County are hard, partially metamorphosed, sedimentary rocks of the Belt Series of Precambrian age. Almost all of the mountainous parts of the county are composed of these rocks. A wide variety of rock types is present, including limestone and reddish, greenish, and gray and purple gray argillite and quartzite. The Precambrian rock units have very low transmissibilities (ability to transmit water). Fractures and faults provide the path for movement and storage of ground water. Water wells drilled into these rocks often yield no water, but more commonly these rocks will yield small amounts, approximately one to ten gallons per minute (gpm), of good quality water to wells. A number of private wells in the Missoula area obtain ground water from Precambrian rocks, but generally these rocks offer little potential for ground-water development.

Rocks of Paleozoic age (280 to 600 million years old) are exposed in small areas east, southeast, and northwest of Missoula. Due to the small areal extent of these rocks, they are of little significance to the county's ground-water resources.

During Tertiary time (one to sixty five million years ago), the valleys in Missoula County were partly filled by a great mass of erosional debris derived from erosion of the nearby mountains. Bedrock in the major valleys is overlain by as much as several thousand feet of unconsolidated to semiconsolidated Tertiary sediments. These sediments consist of sand, gravel, silt, clay, volcanic ash, scattered coal seams, shale, and sandstone. Since deposition, the Tertiary strata have been deformed and are cut by many faults. The Tertiary sediments generally yield small amounts, about one to ten gpm of water to wells and occasionally yield moderate quantities of water ten to fifty gpm. Quality of ground water from Tertiary sediments is generally suitable for stock, domestic, and irrigation purposes.

Missoula County was influenced by glaciation during the Pleistocene epoch. The Clark Fork was dammed several times by continental glaciers forming a huge glacial lake called Lake Missoula in the Clark Fork drainage. Wave cut beaches and glacial erratics indicate the maximum altitude of water in ancient Lake Missoula was about 4,200 feet above sea level. Layers of silt, clay, and sand were deposited from sediment in Lake Missoula. Thin lake deposits and ice rafted rocks are abundant in valleys below 4,200 feet. Relatively thick Pleistocene lake deposits are present along the Clark Fork in the Missoula Valley and in parts of the Blackfoot River drainage. These lake deposits generally are poor aquifers (water yielding materials) but may yield a few gallons of water per minute to wells penetrating sandy zones.

Local alpine glaciation in Missoula County left morainal deposits along many smaller valleys in the mountains. The moraines consist of a mixture of sand, gravel, boulders, silt, and clay and are poor aquifers.

Along most streams in the county are flood plain alluvial deposits of Recent age. These deposits consist of mixtures of sand, gravel, boulders, silt, and clay. They are derived from bedrock sources and from reworked Tertiary deposits. Recent alluvium is abundant along the Clearwater, Blackfoot, and Clark Fork Rivers. The thickness of Recent alluvial deposits is poorly known but probably ranges from a few feet to as much as one hundred feet. In the Missoula Valley, Recent alluvium predominantly consists of sand and gravel and is capable of supplying very large quantities of water to wells. Numerous municipal, industrial, and domestic wells in this area obtain large volumes of good quality water from the Recent alluvium. In the Ninemile Valley and along the Blackfoot, Clearwater, Swan, and Clark Fork Rivers above Missoula, the thickness and water bearing characteristics of the Recent alluvium are poorly known. In most areas, the alluvium should yield moderate to large quantities of good quality water.

Recharge of ground water to aquifers in Missoula County is from precipitation and from infiltration of streamflow. In the Missoula Valley, the Clark Fork recharges much of the water present in the Recent alluvium. A similar situation probably exists in deposits along other streams.

Ground-water resources in the Missoula Valley have been studied, but the remainder of the county remains to be investigated. Ground water is widely used in the Missoula Valley, and considerable additional ground-water development is expected for domestic, irrigation, industrial, and municipal purposes. Ground water is abundant in the Missoula Valley and is of a good quality. In the remainder of the county, ground-water development for domestic and stock purposes will increase. Detailed hydrogeological studies of the Blackfoot, Clearwater, and Swan River drainages will be needed to assist in proper ground-water development.

Sources:
1. M. K. Botz, Montana Bureau of Mines and Geology, Butte, Montana, 1970
2. State Department of Health, Helena, Montana
3. "Water Resources Survey" Missoula County, Montana, Montana Water Resources Board, Helena, Montana, 1960

THE SOILS

GENERAL

General descriptions of soils in specific areas are useful in predicting the potential problems which might be encountered during private and public works construction. Missoula County has an interesting and quite complicated geologic history which has greatly influenced the soil structure of the area. The dominating geologic features are the broad river valleys bordered by high mountain ranges.

The original source of the soil parent materials is primarily the Precambrian quartzites and argillites of the Belt Formation. The majority of the parent materials were transported and deposited during valley glaciation and thus the resulting soils consist of glacial material, alluvium, and lake deposits or the alterations of these materials due to various conditions of climate, topography, and living organisms.

SOIL MAP

The Soil Conservation Service of the United States Department of Agriculture has prepared a general soils map for Missoula County. The map as presented by them is shown in this report as Map 4. In developing this map, the Soil Conservation Service made field studies and observations which resulted in the designation of thirteen general soil areas. Each general soil area as a rule contains a few major soils and several minor soils. Soils within an area may differ greatly in short distances and any one soil may occur in more than one area. Thus, the general soils map does not show the kind of soil at any particular point, but shows specific patterns of soils.

The Soil Conservation Service preliminary draft descriptions of the thirteen soil areas shown on the general soils map are presented as follows:

1. These are shallow to deep forested soils developed over granite on steep slopes with areas of granite rock outcrop.

2. These are shallow to deep forested soils developed over argillite and quartzite rocks on steep slopes with areas of rock outcrop.

3. These are shallow to deep forested soils developed over limestone and calcareous argillites on steep slopes.

4. These are deep, sandy, loamy, and gravelly forested soils on level to rolling glaciated valley plains.

5. These are deep, silty, and clayey forested soils on sloping to hilly valley plains.

6. These are cold alpine soils and rockland on steep mountain tops.

7. These are shallow, very gravelly soils and somewhat poorly drained loamy soils on terraces and flood plains of rivers and streams.

8. These are moderately deep to deep dark colored gravelly loam soils with scattered areas of soils having dense clay subsoils occurring on nearly level to sloping benchlands.

9. These are deep, silty, and clayey soils on sloping to rolling lake terraces.

10. These are deep, somewhat poorly drained, dark colored loamy soils on nearly level valley bottoms.

11. These are moderately deep to deep, dark colored loam and gravelly loam soils on nearly level to sloping valley positions.

12. These are moderately deep to deep, dark colored loamy and clayey soils on nearly level to rolling lake terraces.

13. These are shallow to moderately deep, sandy, and gravelly soils and somewhat poorly drained loamy soils on river flood plains.

CONCLUSIONS

The soils of Missoula County have generally been easy to deal with where shallow domestic water wells and individual sewage drainfields have been constructed. The large amounts of glacial material and alluvium have been found to be extremely variable in permeability, however. This has had an affect on both the quantity of water available in shallow domestic wells and the successful operation of individual sewage drainfields. Some areas of extensive clay and silt deposits require special care in the construction and operation of septic tank drainfields.

Construction of municipal water and sewer systems in the various soils of Missoula County has not been found to be difficult. Pipeline trench digging in the sands and clays is extremely easy while the coarse stream gravels slow operations somewhat. Some bedrock can be expected at normal water and sewer line installation depths.

Source: 1. U. S. Department of Agriculture, Soil Conservation Service, Missoula, Montana

COMMUNITY WATER SYSTEM FACILITIES

GENERAL

This comprehensive report covers the overall problems, existing or projected, for Missoula County, Montana. The volume of data processed and evaluated and the intent of the report allow only a general analysis of any one system.

The intent of this report is to point out the overall needs of each community with the objective that each community may in the future be provided with a safe and adequate water system. The general solutions to overall problems suggested in this report may have to be modified when detailed studies are made. These modifications may be in exact size of parts of a system or in some detailed design variation but will not detract from the overall value of the general information presented.

Basically, the demand for water from community systems is for domestic, fire fighting, and industrial uses. The demand for industrial water supply in small communities has not been extensive in Montana and in most cases will not control the design of community systems. Sufficient water for fire fighting must be considered; however, economic feasibility will usually control the extent of such facilities. In most small communities, a system with sufficient capacity to give high ratings for fire protection would require facilities considerably larger than necessary for domestic purposes. The community might be unable to finance such an improvement; the approach, therefore, has been to propose a system suitable for present domestic needs. These basic facilities can be expanded for more complete service and for higher fire ratings as it becomes economically feasible.

The domestic use of water has increased greatly in recent years. This is partially due to improved economic conditions which make it possible for families to acquire such water consuming appliances as dishwashers, waste disposal units, and automatic washing machines. Water usage for beautifying property has also increased. The most essential condition is adequate, safe, and potable water for domestic purposes, and this has been the primary consideration in this study. See Appendix II for further comments on analysis criteria.

BASIC CONSIDERATIONS

Communities studied in this comprehensive plan were those with a minimum of five potential users and a maximum population of 5,500. Each community within this category was visited at least once. During these visits the type of water facilities available was examined, and an evaluation of the facilities was made from the standpoint of fulfilling the needs of the residents.

The existing systems were found to be quite varied in their operation, condition, and suitability for serving the needs of the users. The situation in each community was evaluated separately; however, some general classification of the various systems was possible. These are described briefly in the following paragraphs so that the general philosophy of the analysis can be shown.

1. In some communities, the homes are quite widespread and few in number. Good water in adequate quantities can be found at reasonable depths. For such situations, private wells will provide a safe and suitable water system.

2. Many communities have had access to good water from private wells for many years. In some of these communities, population is increasing, and the area is becoming more densely settled. As a result, tests for bacteriological quality of well water occasionally indicate that pollution is present. When this occurs, it is usually the beginning of a problem which will continue to worsen. Increasing population and a higher potential for contamination indicate the need for a safe community water facility. The system should be one which will serve the domestic needs of the residents now with provisions for improvements and expansion as needed.

3. Many communities have enjoyed a central water system for years but have not made annual improvements and replacements. This has resulted in overloaded and antiquated systems. Suggestions for immediate improvements which will fit into an overall replace-

ment program are included in this report.

4. Some communities which have experienced a steady population growth are finding that their water systems are inadequate for present demands and will require enlargement. Population projections and economic trends are used to determine the need for improvements and also to justify the type and extent of proposed improvements.

MISSOULA COUNTY

The estimated 1970 population of Missoula County is 58,000. Approximately 29,872, or fifty two percent, of these people are presently served by central water systems, and the remainder are served by private facilities such as wells and springs. By 1980 about 45,540, or fifty five percent of the population, will have access to central water systems if the schedule of proposed improvements is followed. It is expected that the remaining forty five percent will live in outlying areas, and the homes will not be close enough together to make central systems feasible.

WEST RIVERSIDE AND PINEGROVE

Existing System. The estimated 1970 population is 880. Population projections indicate that this area, which includes all development west of the Blackfoot River and north of Interstate 90, will experience a substantial increase in population during the planning period. The development is expected to continue to serve as a bedroom community for Missoula and the Bonner-Milltown complex. Records indicate that wells in the area average between fifty and one hundred feet in depth. It is reported that the quality of the water is good; however, the water does appear to be somewhat hard. There has been no problem in obtaining adequate quantities of water from wells. The size of the population in the area indicates that a central water system would be feasible. Homes in the community are widespread; however, it is expected that additional population will fill in present open spaces.

Improvements Next Five to Ten Years. The 1975 population is expected to be 920. This population is sufficient to warrant construction of a central water system, and it is recommended that the necessary planning begin during this period. Indications are that a well or a combination of wells capable of producing five hundred gallons per minute (gpm) could easily be developed and a storage facility with a capacity of 200,000 gallons is proposed. These facilities, together with the necessary distribution system, would adequately serve the community throughout the planning period. The proposed water system and service area are shown on Map 5.

Improvements by 1990. The 1990 population is expected to reach eleven hundred. The system as proposed would continue to serve the community adequately during this time. It is anticipated that the only other improvements necessary would be the expansion of the distribution system into growth areas.

SEELEY LAKE

Existing System. The estimated 1970 population is 640, and the population of the community is expected to increase steadily throughout the planning period. The area presently served by the community water system is shown on Map 6.

Water supply for this system is pumped directly from a feeder and sump combination in Seeley Lake. The location of this source is along the lake shore 2.2 miles north of the community. Two pumps are located at the source and together they will deliver seven hundred gpm. Storage for the system consists of a 100,000 gallon steel tank located on a hill southeast of the community. The water system was constructed in 1968 and all facilities are in generally good condition. Treatment of the water in this system is by chlorination at the pump house. No pollution problems are apparent at this time.

Water is pumped from the source to the storage reservoir through eight inch asbestos cement pipe. The remainder of the distribution system consists of six inch asbestos cement pipe. Adequate flows are available and pressures at the pumps are over one hundred pounds per square inch (psi). Static pressure in the system averages approximately seventy psi. With eighty seven units currently hooked to the water system, there have been no major problems reported; however, some frozen pipe has been reported under paved roads in the area. The quality of the water obtained from the Seeley Lake source is generally good; however, the water is quite hard compared to present accepted standards.

Improvements Next Five to Ten Years. The population is expected to be seven hundred by 1975. During this period it is expected that the only improvements necessary will be expansion of the present distribution system and looping of dead end lines. The present source and storage facilities will be adequate for the community during this period.

Improvements by 1990. The population is expected to reach one thousand by 1990. During this period additional storage for the system will be necessary, and it is proposed that a 100,000 gallon storage facility be constructed in the same location as the present facility. The present source will continue to provide adequate quantities of water for the system. Continued expansion of the distribution system will be necessary to serve new areas of development which will occur during the planning period.

LOLO

Existing System. The estimated 1970 population of Lolo and vicinity is five hundred. Population projections indicate that this community will continue to grow steadily throughout the planning period. The residents of Lolo obtain their water from individual wells. The quality of the water is good and the water is reported to be quite soft. Plenty of ground water is available from these wells which range in depth from thirty to one hundred feet. Some contamination has been reported in shallow wells during periods of high water and subsequent surface runoff. Water supply from individual wells is currently adequate for this community; however, current population figures and projected increases in housing density in the area indicate that a central water system should be constructed. Homes in the community at this time are widespread and the economics of a central system is a major consideration.

A recent Rural Improvement District located immediately adjacent to Lolo on the north has provided water and sewer service for a proposed large housing development. The general location of the major components of the water system and the development presently existing is shown on Map 7. Partial information available at this time (1970) indicates that storage is provided by a 125,000 gallon tank located west of the development, and that water supply is provided by a four hundred gpm well located east of U. S. Highway 93. Several homes within the new development are presently served by this system.

It is apparent that consideration has been given to the formation of an additional Rural Improvement District to include the community of Lolo for the purpose of supplying water to the community from the existing system. Preliminary design calculations along with projected population figures indicate that the capacity of the existing storage and source are adequate to serve the community of Lolo.

Improvements Next Five to Ten Years. The 1975 population of Lolo is expected to be 550. This population figure indicates that construction of a central water system would be feasible, and it is proposed that the necessary planning for utilization of the existing system be conducted during this time. The proposed service area for the community of Lolo and its relationship to the existing system are shown on Map 7.

Improvements by 1990. The 1990 population of Lolo is expected to be seven hundred. The existing system and the proposed extended service for Lolo would continue to serve the community adequately during this period. Further improvements would include extension of the distribution system into growth areas and refinements within the system such as looping of dead end lines and the possible addition of a new well or equivalent pressure boosting facilities.

CLINTON

Existing System. The estimated 1970 population is 220. The residents of Clinton obtain their water from individual wells. The quality of water obtained from these wells is generally very good and plenty of water is available. The average depth of the wells in this area is fifty feet. There is no central sewage system in the community of Clinton, and some reported water well contamination has been attributed to the infiltration of domestic sewage into the high, rapidly flowing ground-water table. The problem along with projected population growth indicates that a central water system is necessary and would be feasible.

Improvements Next Five to Ten Years. The population is expected to be 230 by 1975. A community water system facility is feasible for a community of this size and should the local demand for improved facilities develop during this period a system as shown on Map 8 would adequately serve the needs. A well capable of producing 130 gpm could be developed at a location within the community. Development of existing springs northeast of the community would also be an alternate source of supply. Economic considerations would determine whether use of the springs would better serve the community. Storage for the system would be provided by a fifty thousand gallon tank located on the hill northeast of the community. The supply and distribution system would consist of six inch pipe.

Improvements by 1990. The population is expected to be 270 by 1990. The system proposed in the five to ten year plan will be adequate to serve the community during this period. No other improvements or expansion of the system are believed to be necessary throughout the planning period.

PILTZVILLE

Existing System. The estimated 1970 population is 270. The population is expected to show some increase during the planning period. The residents presently obtain their water supply from private wells which range in depth from fifty to less than one hundred feet. Water quality is reportedly very good and there is adequate quantity for the needs. Some well contamination has been reported and this has at least partially been attributed to the fact that the community consists of homes located relatively close together and adjacent to a steep hillside. It is recommended that a community water system be developed that would provide a safe water supply to all residents of this community. A water system to serve this community would also be available to serve other rural residents located on either side of Interstate Highway 90 east of the community of Piltzville.

Improvements Next Five to Ten Years. The population is expected to increase to 285 by 1975. This population could be feasibly served by a community water system such as the one shown on Map 9. A well capable of producing 160 gpm could be located as shown, and a storage facility with a capacity of sixty thousand gallons could be constructed on the hill north of the community. These facilities together with a distribution system consisting of six inch pipe would adequately serve the community throughout the planning period.

Improvements by 1990. The 1990 population is expected to reach 350. The system as proposed would continue to serve the community adequately, and it is anticipated that the only further improvements would be the expansion of the existing distribution system to serve areas of new development.

HUSON

Existing System. The estimated 1970 population of this community is ten. This population is expected to remain steady throughout the planning period. The residents presently obtain their water supply from private wells which provide water in adequate quantities and satisfactory quality. Some residents have quite shallow wells, and from these wells the water obtained is very hard. The depth of the shallow wells is around thirty feet. The deeper wells, which range up to 180 feet in depth, produce water of much better quality. Plenty of water is available at all levels, and no pollution problems have been reported. It is not believed that any type of central water system is feasible at this time or throughout the planning period. The present use of private wells will result in an adequate water system for the community needs.

LOLO HOT SPRINGS

Existing System. The estimated 1970 population of this community is ten, and this population is expected to remain fairly steady throughout the planning period. As this community is primarily a tourist resort, seasonal fluctuations in population can be expected. The residents of this community presently use private wells and springs for their water supply. Water of satisfactory quality is available in limited amounts in wells averaging up to one hundred feet in depth. A central water system facility is not believed to be necessary for this community as the present individual systems will be adequate for the need throughout the planning period.

POTOMAC

Existing System. The estimated 1970 population of Potomac is fifty. This population is expected to increase steadily throughout the planning period. The people of Potomac obtain their water from individual wells. The water obtained from these wells is quite hard but the quality is good. There have been times when quantity of water available has not been adequate. Also, some contamination in the shallower wells has been reported. The average depth of wells in the area is approximately one hundred feet. A well at the school, however, is 680 feet deep. Water from the original school well, which was approximately one hundred feet deep, was determined to be of poor quality. The 680 foot well was then drilled, and it was determined that the quality of that water was also inadequate. The school, however, continues to use the water from the deeper well and recently has obtained better reports on the quality of the water.

Improvements Next Five to Ten Years. The population of Potomac is expected to be sixty by 1975. Considering the existing contamination problem and the population increase projection, a community water system facility is necessary and feasible for this community. Should the demand for improved facilities develop during this period, a system as shown on Map 12 would adequately serve the needs. A well capable of producing thirty five gpm could be developed at a location within the community. Pressure in the proposed system could be maintained by the installation of a constant pressure pumping facility or the installation of a twelve thousand gallon storage facility located on a hill northeast of the community.

Improvements by 1990. The population is expected to increase to eighty by 1990. The system as proposed in the five to ten year plan would be adequate to serve the needs of the community throughout the entire planning period. Improvements necessary during this period would include extension of the distribution system to serve new areas.

FRENCHTOWN

Existing System. The estimated 1970 population of this community is 150. This population is expected to increase steadily throughout the planning period. The residents of Frenchtown obtain their water from individual wells. The quality of water from these wells is good; however, the water is moderately hard. Plenty of ground water is available in this area. There has been no pollution problem that has been serious; however, some shallow wells have had contamination from surface runoff. Although many shallow wells exist in the community of Frenchtown, the average depth of wells is approximately 160 feet. Current population figures and projections and the existence of some problems with individual water systems indicate that a community water system facility is feasible and necessary for the residents of this community.

Improvements Next Five to Ten Years. The population is expected to increase to 155 by 1975. A community water system facility is feasible for this number of persons, and it is proposed that it be constructed during this period. Water supply could be obtained from a well drilled near the community and producing ninety gpm. Pressure within the water system could be maintained by the installation of a constant pressure pumping facility at the well head or by providing a thirty thousand gallon storage facility on the hill northeast of the community. The economics of these two alternatives would have to be studied in detail before a choice could be made. A representation of the system described above is shown on Map 13.

Improvements by 1990. By 1990 the population is expected to be 175. The water system as proposed under the five to ten year plan would be adequate for the needs during the entire planning period. Improvements necessary during this time would be the extension of distribution system lines and normal system maintenance.

SWAN RIVER TRACTS

Existing System. The estimated 1970 population of this rural community is thirty. This population is expected to decrease slightly during the planning period.

This area, however, is representative of summer home developments throughout western Montana. Although yearlong population figures are low, seasonal population loading can be severe. Well records for the Swan River Tracts area indicate that water of satisfactory quality can be obtained from wells ranging up to fifty feet in depth. Increased density of summer homes in areas such as the Swan River Tracts will eventually result in the necessity of constructing central water and sewerage systems.

Improvements by 1990. The yearlong population of the Swan River Tracts is expected to decrease to twenty five by 1990. The seasonal population figure, however, is expected to be considerably greater than that. Should this occur as expected and the demand for improved facilities develops during this period, a system as shown on Map 14 would adequately serve the needs. A well capable of producing twenty gpm could be developed at a location within the community, and a storage facility with a capacity of six thousand gallons could be located on a hill nearby. A system of this type would adequately serve the yearlong population of the community and would also serve short term seasonal increases in population. A more detailed study would be necessary to determine the exact size of a water system which would be best suited for serving the yearlong population needs.

TURAH

Existing System. The estimated 1970 population of this community is sixty five. This population is expected to decrease slightly throughout the planning period. The residents of Turah presently obtain their water supply from individual wells. Plenty of satisfactory quality water is available in wells ranging from thirty to sixty feet in depth. This community is representative of the rural growth which is occurring along Interstate 90 between Missoula and Clinton. Continued rural development of this nature, not necessarily within the community of Turah, could result in the necessity of constructing a rural water system.

Improvements by 1990. The population of Turah is expected to decline to forty by 1990; however, scattered rural development is expected to continue during this period. Additional study will be necessary to determine whether long range rural water systems or individual community systems would best suit the needs of this development. Individual community systems, such as that shown for Turah on Map 15, could be developed. In the case of Turah a well could be developed within the community to produce thirty gpm and storage with a capacity of twelve thousand gallons could be located on a hill nearby. A system of this type would adequately serve the needs of the community throughout this planning period. Slight alteration of both source and storage facilities in this system would enable service to be extended to outlying areas.

COMMUNITY SEWER SYSTEM FACILITIES

GENERAL

Each use of water adds some material or alters some characteristic enough to change the original quality of the water and often to pollute it. The transportation and dilution of municipal, industrial, and agricultural wastes are important and necessary uses of water; therefore, special emphasis is placed on the control of water pollution from these sources. Some of these wastes can be carried in limited amounts without damage to the resource. Some wastes if discharged into water courses can make their way into underground aquifers and pollute the ground water so that it is unsuitable for further use.

Pollution by definition and interpretation is a matter of degree. Since it is inevitable that the quality of water will be altered with each use, it is of critical importance to control the degree of pollution.

It is public policy, established by the state legislature, to maintain reasonable standards of purity for the water of the state. These standards are to be consistent with the use of these waters, including their use in carrying away the water borne waste products of society. The current Federal Water Pollution Control Act in reference to pollution abatement gives the individual states discretion in assessing the physical and economic feasibility of complying with water quality standards. The "Water Quality Criteria," "Water Use Classifications," and "Policy Statements" of the Montana Water Pollution Control Council for streams and rivers in Montana have been included in Appendix I.

Sewage may be broadly categorized as either domestic or municipal waste, industrial waste, or animal and agricultural waste. Animal wastes are usually not involved in community sewage facilities; however, they do constitute a potential source of pollution which must be controlled and prevented from entering streams or other potential water supplies.

Although industrial activity throughout Montana has been limited, the need for control and treatment of industrial wastes is apparent. Industrial wastes vary in quantity and composition as greatly as the products and processes which generate them. They include toxic chemicals, solids carried in suspension, brines, strong acids and alkalies, oils, dyes, floating solids, and the heat generated by industrial processes. Industrial wastes are not found to be a major factor in the design of most community sewage facilities. Where economic projections indicate industrial development, the relationship to loading on domestic sewer systems is considered.

Domestic sewage is the primary consideration in this study and has been the basis for design and analysis. Where particular systems are subjected to loading from industrial sources, a more detailed study will be necessary. The general approaches outlined in "Analysis Criteria" in Appendix III will suffice in practically all cases.

BASIC CONSIDERATIONS

There are generally three main methods of sewage disposal. These are septic tanks, mechanical sewage treatment plants, and wastewater stabilization ponds. Local soil conditions, availability of land, and density of population are the basic factors which govern the selection of a particular method.

Many of the smaller communities have relied on individual septic tanks and cesspools for each home to handle sewage disposal. Septic tanks are suitable if the population density is low and if the systems are properly designed and maintained. Overflow from these tanks must drain into the soil and depending on local soil conditions may or may not create a problem. There is a limit to the amount of water that even loose granular soil can absorb. Density of population and the length of time the effluent has been entering the soil are factors which indicate whether septic tanks can be suitable for sewage disposal.

When economically feasible, community sewage collection and disposal systems are much more desirable than individual systems. Community systems eliminate the worry of septic tank failure, the danger of well contamination, and the problem of soil saturation. However, it is usually uneconomical to serve a few homes scattered over a large area with a community sewer system.

The type of sewage disposal facilities to be used can generally be determined on the basis of economic factors. Mechanical treatment plants provide an excellent means of sewage disposal although the initial cost, maintenance cost, and power cost are usually high. Wastewater stabilization ponds are an ideal method of sewage disposal and usually are the most economical to construct and maintain.

The Montana Water Pollution Control Council has established the criteria that treatment of domestic and industrial waste shall be secondary treatment or its equivalent. For domestic sewage, mechanical treatment plants, or stabilization ponds, when either is properly designed, constructed, and operated, meet these requirements.

A schedule for completion of secondary treatment facilities by communities across the state has been established by the State Department of Health. The target date is included for individual towns when applicable.

MISSOULA COUNTY

In Missoula County, only the City of Missoula is presently served by community sewer facilities. Approximately 29,200 people, or just over fifty percent of the county population, are served by these facilities. By 1990 about 45,500, or approximately fifty five percent of the population, will have access to community sewer facilities if the proposed expansion program is followed. The remaining percentage will live in outlying areas, and the homes will not be close enough together to make community sewer systems feasible.

WEST RIVERSIDE AND PINEGROVE

Existing System. The 1970 population is estimated to be 880. Sewage disposal in this combined community is handled through septic tanks and cesspools. Operational problems are normal and there are no pollution problems reported. The soil in this area is quite gravelly and good drainage is available. Population projections indicate that this community will continue to grow throughout the planning period. The combined population of these two rural communities is adequate to justify the construction of a central sewage collection and disposal system. The homes in the area are quite widespread, and a more detailed economic study will reveal the feasibility of constructing such a system.

Improvements Next Five to Ten Years. The population is expected to be 920 by 1975. It is proposed that a central sewer system be constructed during this period. An eleven acre wastewater stabilization pond or a mechanical sewage treatment plant with a capacity of 110,000 gallons per day could be constructed along the west bank of the Blackfoot River east of West Riverside. Economic considerations and land acquisition possibilities will determine which of the treatment facilities is more feasible. The proposed sewer system and service area are shown on Map 16.

Improvements by 1990. The 1990 population is expected to reach eleven hundred. The system proposed in the five to ten year plan will be adequate to handle the needs of the community throughout this period. The only improvements which would be necessary during this period would be expansion to serve additional areas.

SEELEY LAKE

Existing System. The 1970 population is estimated to be 640. Sewage disposal in Seeley Lake is handled by septic tanks and cesspools. Normal operational problems have been encountered with these individual systems; however, the major concern has been about sewage from the community contaminating the lake itself. Algae is forming along the shore at this time. A very high ground-water table exists beneath the community, and the movement of underground water carries drainage from septic tanks and drainfields directly to the lake. The soil in the area is quite gravelly and aids in this flow. There has been consideration of a central sewer system, but with the cost of the recently installed water system already outstanding, the people of the community feel that a central sewer system would be difficult to finance.

Improvements Next Five to Ten Years. The population is expected to be seven hundred by 1975. It is proposed that a community sewer system be planned and constructed during this period. A system which would serve the needs of this community during the planning period is shown on Map 17. Due to the irregular topography of the Seeley Lake area, at least two lift facilities and several hundred feet of force main would be necessary to satisfactorily serve the community. Depending on the results of a more detailed engineering and economic study of the situation, sewage treatment could be provided by either a mechanical treatment plant of 100,000 gpm capacity or a ten acre wastewater stabilization pond. It is possible that the community could be best served by the installation of two sewage treatment facilities. Further studies and economic considerations would be necessary before a choice could be made.

Improvements by 1990. By 1990 the population of Seeley Lake is expected to be one thousand. The system proposed in the five to ten year plan will be adequate to handle the needs of the community throughout this period. The only improvements which would be necessary during this period would be expansion to serve additional areas.

LOLO

Existing System. The 1970 population of Lolo is estimated to be five hundred. Sewage in the Lolo area is handled by septic tanks and drainfields. The water table in this area is quite high and at times has caused problems with the operation of these septic tanks. Pollution or contamination has not been a major problem. The soil is quite gravelly, and despite the high water table, drainage is good. Movement of ground water beneath the surface aids in the operation of drainfields. As this area continues to develop and population densities increase, contamination of shallow water wells could become a critical problem. The population is adequate to justify the construction of a central sewage collection and disposal system. The homes in the area are quite widespread, and economic consideration will be a major factor in the design of a central system.

A Rural Improvement District adjacent to Lolo on the north has provided facilities for sewage collection and treatment for a large new housing development. As shown on Map 18, the sewage treatment plant provided for this development has a capacity of 250,000 gallons per day. The plant is located on the west bank of the Bitterroot River north of the proposed development. Consideration has been given to the possibility of the formation of an additional Rural Improvement District through which the community of Lolo could be served by the existing facility. Preliminary engineering calculations and population projections indicate that the existing sewage facility would be of adequate capacity to serve the Lolo area.

Improvements Next Five to Ten Years. The population of Lolo is expected to reach 550 by 1975. It is proposed that during this period the indicated Rural Improvement District be formed and the community of Lolo take advantage of the existing sewage treatment facility. A proposed system which would serve the community of Lolo and utilize the existing treatment plant is shown on Map 18. As shown, most of the community could be served by eight inch gravity flow sewer pipe; however, at least one lift facility and several hundred feet of four inch force main would be necessary to serve the southern portion of the community. After obtaining more detailed information on the existing system, recommendations could be made as to the best method for interconnecting the two systems.

Improvements by 1990. The population of the Lolo area is expected to increase to seven hundred by 1990. Connection to the existing system as proposed in the five to ten year plan will provide adequate service for Lolo throughout the planning period. Improvements necessary during this period would include expansion to serve additional growth areas and normal maintenance.

CLINTON

Existing System. The 220 persons who presently reside in Clinton use private septic tanks and cesspools for sewage disposal. Soil profiles in the area consists of a very small layer of top soil over coarse river gravels. Tremendous ground-water flows exist just below the surface, and sewage from septic tanks and cesspools is rapidly absorbed in this flow. Some contamination of shallow wells has resulted from this situation, and it has been reported that the Clark Fork shows evidence of receiving much of the sewage effluent. Population projections indicate that the community of Clinton will continue to grow steadily throughout the planning period. The potential health hazard and the indicated population growth for this community make the construction of a central sewage facility necessary and feasible.

Improvements Next Five to Ten Years. By 1975 the population is expected to be 230. A community sewer system which could very possibly operate completely by gravity is shown on Map 19. Dwelling units in the community are located in a rather uniform pattern so that a minimum of collection piping would be necessary. Sewage treatment could be provided by a three acre wastewater stabilization pond or by a thirty thousand gallon per day sewage treatment plant.

Improvements by 1990. The population is expected to reach 270 by 1990. The sewer system facility as proposed under the five to ten year plan would be adequate for the needs of this community throughout the planning period. Minor refinements and additions to the original collection system and normal maintenance would be the only work required during this period.

PILTZVILLE

Existing System. The 1970 population of Piltzville is estimated to be 270. Sewage in Piltzville is disposed of by septic tanks with drainfields. Operational problems are normal with these individual systems; however, there have been some reports of contamination of shallow wells in the area. The soil in the Piltzville area is quite gravelly and drainage is good. As population densities increase along the Clark Fork Valley east of Missoula, a sewer service will have to be provided for those developments. A much more detailed study would be required to determine whether a large single system could serve the area economically. It appears that until a large single system is economically feasible, smaller individual systems will have to be built to handle current problems. These systems could be planned in such a manner that eventually they could all be tied to a central treatment facility.

Improvements Next Five to Ten Years. The population of Piltzville is expected to be 285 by 1975. A community sewer system is proposed and a layout is shown on Map 20. At least one lift facility would be required for the area north of Interstate Highway 90, and depending upon the final choice of a treatment facility, at least one other lift facility might be required. A 3.5 acre wastewater stabilization pond would be required to serve the needs of the community of Piltzville. As land acquisition for the construction of a wastewater stabilization pond might be difficult, it is probable that a thirty five thousand gallon per day sewage treatment plant would be more feasible.

Improvements by 1990. The population is expected to increase to 350 by 1990. The central sewer system as proposed in the five to ten year plan would be adequate for the community needs through 1990. It is possible that during this time the system could be expanded to handle increased rural growth in the area such as the community of Turah east of Piltzville. Also, the entire system could be absorbed by larger facilities serving the entire Clark Fork Valley development.

HUSON

Existing System. The 1970 population of Huson is estimated to be ten, and this population is expected to remain fairly steady throughout the planning period. Sewage in Huson is handled by septic tanks, cesspools, and drainage rings. Drainage rings are described as being circular drainage pits or drainfields. Soil in the area is quite gravelly beneath a variable thickness of clay top soil. The clay thickens toward the foot hills but is quite thin in the valley bottom. Reported problems with these individual systems are few and only normal maintenance has been required. A community sewer system facility is not necessary for this development as the present private facilities will adequately serve the needs of this community throughout the planning period.

LOLO HOT SPRINGS

Existing System. The permanent yearlong population of Lolo Hot Springs is estimated to be ten, and this population figure is not expected to vary substantially throughout the planning period. The residents of this community currently dispose of their sewage through individual systems. It is not anticipated that improved sewage facilities will be necessary during the planning period; however, a more detailed study of seasonal population loading may reveal a need for improved facilities. In the event that a central system was determined to be necessary, a gravity collection system combined with a sewage treatment plant or a wastewater stabilization pond could be expected to serve the community adequately.

POTOMAC

Existing System. The estimated 1970 population of Potomac is fifty, and this population is expected to increase throughout the planning period. Sewage is handled by septic tanks and drainfields. In general, soils in the area consists of lake bed clays and silts underlain by solid rock. Drainage into and ground water flow through this type of soil is very poor. There have been some reports of poor ground water quality in the area and also some evidence of contamination in a nearby stream. There is sufficient population presently residing in the community to make a central sewer system facility feasible.

Improvements Next Five to Ten Years. By 1975 the population of the community is expected to be sixty. A community sewer system is proposed and a layout is shown on Map 23. The community is quite compactly laid out, and a gravity collection system connected to a one acre wastewater stabilization pond would satisfactorily serve the community.

Improvements by 1990. The population is expected to increase to eighty by 1990. The sewer system facility as proposed under the five to ten year plan would continue to serve the community throughout the planning period.

FRENCHTOWN

Existing System. The 150 persons presently residing in this community use private septic tanks and drainfields for sewage disposal. Pollution or contamination problems have not been apparent as the soil in the area is quite gravelly and good drainage is available. Dwelling units in this community are not excessively widespread, and current population figures and projections indicate that a community sewer system facility is feasible.

Improvements Next Five to Ten Years. By 1975 the population of Frenchtown is expected to be 155. A community sewer system is proposed and a layout is shown on Map 24. The collection system would consist of eight inch pipe, and at least one lift facility would be required to adequately serve the community. Sewage treatment could be handled by the construction of a 1.7 acre wastewater stabilization pond or the installation of a 17,500 gallon per day sewage treatment plant. Land acquisition possibilities and economic considerations would have to be studied before a choice could be made.

Improvements by 1990. The population is expected to increase to 175 by 1990. With slight expansion and refinement to the collection system constructed under the five to ten year plan, the proposed system would continue to serve the community throughout this portion of the planning period.

SWAN RIVER TRACTS

Existing System. The thirty persons who presently reside yearlong in this community use private systems for sewage disposal. These systems reportedly function satisfactorily; however, increased density of summer homes constructed in the area and seasonal population loadings may make a central sewage disposal facility feasible.

Improvements by 1990. The yearlong population is expected to be twenty five by 1990. Summer home construction and seasonal use of these homes is expected to increase during this time, however. If it is determined that these loadings are excessive and a central sewage system is needed, a system such as is shown on Map 25 would serve the community adequately. Location of various facilities will depend upon economic considerations and the eventual further development of the summer home sites. A gravity collection system supplemented by lift facilities where necessary would carry sewage to a proposed 0.5 acre wastewater stabilization pond or a five thousand gallon per day sewage treatment plant. As indicated previously, a further study of seasonal population loadings would determine the most efficient size of treatment facility to serve the system.

TURAH

Existing System. The 1970 population of Turah is estimated to be sixty five. This population is expected to decline slightly throughout the planning period in the community of Turah itself; however, increased development along the Clark Fork Valley between Clinton and Missoula can be expected during this time. The residents of these developments currently use private sewage disposal systems which reportedly operate satisfactorily. Increased population density along this strip development may eventually require the installation of central sewage disposal facilities. It may not be feasible for a small community such as Turah to install its own central facility; however, an adequate solution may be to arrange for service with the proposed Piltzville system located just east of Turah. Eventually, the entire strip development may be most economically served by a single central system.

Improvements by 1990. It is proposed that the community of Turah arrange connection to the Piltzville sanitary sewage disposal system by 1990. The proposed approximate service area for this community is shown on Map 26.

APPENDIX I.

MONTANA WATER LAW AND WATER QUALITY CRITERIA

SURFACE—WATER LAW

Two basic laws which concern surface-water rights are recognized in the United States. They are the Doctrine of Riparian Rights and the Doctrine of Prior Appropriation. The Doctrine of Riparian Rights originated in England and is in widespread use in the eastern United States. Basically, this doctrine gives the owners of land bordering a stream the right to have that stream flow past their land undiminished in quantity and unaltered in quality and to use it for household and livestock purposes. Under the Riparian Doctrine, the water is restricted to riparian owners, and it is unlawful for them to reduce significantly the flow of the stream.

It was determined early in the history of Montana that the Doctrine of Riparian Rights was unsuited to the conditions here. First, it was obvious that diversion and reduction of stream flow was a necessity to mining and agricultural uses, and second, much of the land in Montana was under public rather than private ownership. The Doctrine of Prior Appropriation was much more suited to the region and was formally adopted by the Montana Supreme Court in 1921. The appropriation right originated in California where the early gold miners diverted water from streams to placer-mine gold. Water rights were considered in the same manner as mining claims; those who were first in time were first in right and the quantity or size of right was determined by the amount beneficially used.

The five basic points of the Doctrine of Prior Appropriation are:

1. The use of water may be acquired by both riparian and non riparian landowners.
2. It allows diversion of water regardless of the reduction of the water supply in the stream.
3. The value of the right is determined by the priority of the appropriation, i.e., first in time is first in right.
4. The right is limited to the use of the water. Stream waters in Montana are the property of the state and the appropriator acquires only a right to their use. Moreover, this use must be beneficial.
5. A right to the use of water is considered property only in the sense that it can be bought or sold; its owner may not be deprived of it except by due process of law.

No water right may be acquired on a stream in Montana without diversion of water and its application to a beneficial use. The method of acquiring or appropriating a right to water has been outlined by the state legislature. The procedure for appropriation from an unadjudicated stream is:

1. Posting of notice in a conspicuous place at the point of intended diversion stating:
   a. quantity of water claimed
   b. use for which water is claimed and place of use
   c. description of means of diversion
   d. date of appropriation
   e. name of appropriator
2. Filing, within twenty days after date of appropriation, of a notice of appropriation with the county clerk including in addition to the posted notice:
   a. name and description of the stream
   b. description of point of diversion with reference to a permanent monument or natural marker
   c. verification by affidavit of the appropriator that facts of the notice are true

Montana laws do not require that a water user file an official record of the completion of an appropriation. It is, therefore, a fact that in many instances the demand for the water of a stream is much greater than the supply available. In such cases there is a means by which the rights and priorities of each user along a specific stream may be officially determined. The action of adjudication or water right suit may be initiated by any one or more of the appropriators. The Judge of the District Court then examines all of the claims and issues a decree establishing priority of right of each water user and the amount of water he is entitled to use.

The procedure for appropriation of water from adjudicated streams is slightly more complicated than that of unadjudicated streams. For adjudicated streams an appropriator shall:

1. Employ a competent engineer to survey the area and means of conducting water from its source to place of intended use.
2. Have aerial photographs and maps thereon to show the course of the intended diversion or location of intended impoundment.
3. File with the Clerk of the Court of the county of appropriation a petition which includes:
   a. the amount of water sought by appropriation
   b. a description of the watercourse or body from which water is intended to be appropriated
   c. a description of the means of diversion or size, location and manner of construction if a reservoir is intended
   d. the engineers survey and aerial photographs
   e. a declaration by the appropriator that the rights sought shall be subject to and bound by any decree theretofore rendered adjudicating the waters or any body to which the waters may be tributory
4. Name all others who have or appear to have rights in the source of supply as defendants in the appropriation proceeding.

Upon completion of the above procedure, a trial is held and normally a decree results. If a new appropriation is granted, the appropriator shall be bound by all prior rights and decrees.

GROUND–WATER LAW

The quantity of ground water stored beneath the surface of the earth in Montana exceeds that on the surface. For many years use of this vast ground-water resource was very limited and no need for regulating its use was deemed necessary. In recent years the use and development of ground-water resources has increased considerably and it was realized that, without some means of regulation, ground water in some areas might be withdrawn at a faster rate than it could be naturally replenished.

In 1961 the 37th Legislative Session of Montana passed a bill which created a Ground Water Code in Montana (Chapter 237, Revised Codes of Montana, 1961). This bill became law on January 1, 1962, and the State Engineer of Montana was designated as the "Administrator."

The Ground-Water Law contains many provisions which are considered pertinent to this comprehensive plan, and, therefore, portions of these provisions will be presented in this report. They are:

Section 1. Definitions or Regulations As Used In The Act.

a. "Ground Water" means any fresh water under the surface of the land including the water under the bed of any stream, lake, reservoir, or other body of surface water. Fresh water shall be deemed to be the water fit for domestic, livestock, or agricultural use. The Administrator, after a notice of hearing, is authorized to fix definite standards for determining fresh water in any controlled ground-water area or sub area of the state.

b. "Aquifer" means any underground geological structure or formation which is capable of yielding water or is capable of recharge.

c. "Well" means any artificial opening or excavation in the ground, however made, by which ground water can be obtained or through which it flows under natural pressures or is artifically withdrawn.

d. "Beneficial use" means by economically or socially justifiable withdrawal or utilizations of water.

e. "Person" means any natural person, association, partnership, corporation, municipality, irrigation district, the State of Montana, or any political sub-division or agency thereof, and the United States or any agency thereof.

f. "Administrator" means State Engineer of the State of Montana.

g. "Ground-Water area" means an area which, as nearly as known facts permit, may be designated so as to enclose a single distinct body of ground water which shall be described horizontally by surface description in all cases and which may be limited vertically by describing known geological formations, should conditions dictate this to be desirable. For purpose of administration, large ground-water areas may be divided into convenient administrative units known as "sub-areas."

Section 2. Right To Use. Rights to surface water where the date of appropriation precedes January 1, 1962, shall take priority over all prior or subsequent ground-water rights. The application of ground water to a beneficial use prior to January 1, 1962, is hereby recognized as a water right. Beneficial use shall be the extent and limit of the appropriative right. As to appropriations of ground water completed on and after January 1, 1962, any and all rights must be based upon the filing provisions hereinafter set forth, and, as between all appropriators of surface or ground water on and after January 1, 1962, the first time is first in right.

Any ground water put to beneficial use after January 1, 1962, must be filed upon in order to establish a water right thereto. Four different types of forms have been provided for filing. The titles of the forms are:

Form No. 1 "Notice of Appropriations of Ground Water"
Form No. 2 "Notice of Completion of Ground Water by Means of a Well"
Form No. 3 "Notice of Completion of Ground Water Appropriation Without a Well"
Form No. 4 "Declaration of Vested Ground Water Rights"

Form No. 1 is optional and Form No. 4 was for those who had put ground water to a beneficial use before January 1, 1962. Again, it is important to recognize that the ground-water law states especially that, "Until a notice of completion (Form No. 2 or No. 3) is filed with respect to any use of ground water instituted after January 1, 1962, no right to that use of water shall be recognized."

WATER QUALITY

The State Department of Health, under the supervision of the State Water Pollution Control Council, is responsible for administering the water pollution laws of the state. As stated in the resume of Montana water laws published by the Montana Water Resources Board, "the Department of Health has superivsion over all state waters which are directly or indirectly being used as a public water supply." The Water Pollution Control Council is responsible for classifying water and formulating a program for pollution control.

The Water Pollution Control Council has adopted specific "Water Quality Criteria;" established "Water Use Classifications;" and issued a complete list of "Policy Statements." The original adoption of these standards took place October 5, 1967, and since that time they have been made available to interested persons by the State Department of Health. A portion of the information available from the Department is the detailed chemical, physical, and biological standards of the "Water Quality Criteria" for effluent water. Water quality standards for domestic water, as set forth by the United States Public Health Service, are shown in Table A. The Montana Water Pollution Control Council "Policy Statements" and "Water Use Classifications" are presented in the following paragraphs.

The Water Pollution Control Council has added a new policy statement at the request of the Federal Water Pollution Control Administration. The new statement is:

> *Waters whose existing quality is better than the established standards as of the date on which such standards become effective will be maintained at*

the high quality unless it has been affirmatively demonstrated to the state that a change is justifiable as a result of necessary economic or social development and will not preclude present and anticipated use of such waters. Any industrial, public or private project or development which would constitute a new source of pollution or an increased source of pollution to high quality waters will be required to provide the necessary degree of waste treatment to maintain high water quality. In implementing this policy, the Secretary of the Interior will be kept advised in order to discharge his responsibilities under the Federal Water Pollution Control Act, as amended.

The originally adopted "Policy Statements" are:

1. *Quality of waters classified for multiple use shall be governed by the most stringent criteria listed for any use.*
2. *The Council has classified as "A–Closed" only those waters on which access and other activities are presently controlled by the utility owner. If other uses are permitted by the utility owner, these waters shall be reclassified "A–Open" or lower. Conversely, waters in the "A–Open" classification, if shown to meet the "A–Closed" criteria, may be so classified by the Council at the request of the utility owner.*

   Where "A–Open" water is used for swimming and other water contact sports, a higher degree of treatment may be required for potable water use.
3. *The water quality standards are subject to revision (following public hearings and, in the case of interstate streams, concurrence of the Federal Water Pollution Control Administration) as technical data, surveillance programs and technological advances make such revisions desirable. There are waters in the state on which little water quality data is presently available. Water quality criteria for these waters was established to protect existing and future water uses on the basis of the most representative information available.*

   In some cases, particularly in eastern Montana, waters have been classified "B" and "C" where the upper ends of the streams will probably be suitable for this use while the lower ends will not. However, not enough data is available to determine where the "B" and "C" designation should be dropped. Whenever a water supply or swimming area is developed, the regulations and the advice of the State Board of Health should be acquired. As time permits, data will be obtained and the classifications reviewed.
4. *As used in the Water Quality Criteria, the phrases "natural," "naturally present" and "naturally occurring" are defined as conditions or material present from runoff or percolation over which man has no control or from developed land where all reasonable land, soil and water conservation practices have been applied. Waters below existing dams will be considered natural.*
5. *It is the intent of the criteria that the increase allowed (temperature for example) above natural conditions is the total allowable from all waste sources along the classified stream.*
6. *Although the water quality criteria specify minimum dissolved oxygen concentrations, it shall be the policy of the Council to require the best practicable treatment or control of all oxygen-consuming wastes in order to maintain dissolved oxygen in the receiving waters at the highest possible level above the specified minimums.*
7. *For treatment plant design purposes, stream flow dilution requirements shall be based on the minimum consecutive seven day average flow which may be expected to occur on the average once in ten years.*
8. *Where sampling stations and points of mixing of discharges with receiving waters as mentioned in the water quality criteria are to be established on interstate waters, the concurrence of the Federal Water Pollution Control Administration will be solicited.*

TABLE A
Water Quality Standards

Characteristic	Permissible Concentrations in Milligrams Per Liter	Objections to Concentrations Beyond Permissible Limits
Turbidity	5*	Esthetic
Color	15*	Esthetic
Threshold Odor Number	3*	Esthetic
Alkyl Benzene Sulfonate (ABS)	0.5	Taste, Foaming, Indicator of Pollution
Arsenic (As)	0.01	Toxic
Chloride (Cl)	250	Possible Laxative Effect
Copper (Cu)	1.0	Possible Physiological Effect
Carbon Chloroform Extract (CCE)	0.2	Toxicological Interest
Cyanide (CN)	0.01	Toxic
Fluoride (F)	See Below	Mottling of Teeth
Iron (Fe)	0.3	Esthetic, Staining of Laundry
Manganese (Mn)	0.05	Esthetic, Staining of Laundry
Nitrate	45	Methemoglobinemia
Phenols	0.0001	Taste
Sulfates	250	Possible Laxative Effect
Total Dissolved Solids	500	Possible Laxative Effect
Zinc (Zn)	5	Possible Laxative Effect
Radium-226	3**	Radiation Damage
Strontium-90	10**	Radiation Damage
Gross Beta Radioactivity	1,000**	Radiation Damage

Concentrations in excess of following should be re-examined before use (mg/l):

Arsenic (As)	0.05	Fluoride (F)	See Below
Barium (Ba)	1.0	Lead (Pb)	0.05
Cadmimum (Cd)	0.01	Selenium (Se)	0.01
Hexavalent Chromium (+6)	0.05	Silver (Ag)	0.05
Cyanide (CN)	0.2		

Annual Average of Maximum Daily Air Temperature	Recommended Control Limits— Fluoride Concentrations in mg/l		
	Lower	Optimum	Upper
50.0 to 53.7	0.9	1.2	1.7
53.8 to 58.3	0.8	1.1	1.5
58.4 to 63.8	0.8	1.0	1.3
63.9 to 70.6	0.7	0.9	1.2
70.7 to 79.2	0.7	0.8	1.0
79.3 to 90.5	0.6	0.7	0.8

Hardness Standards for Water

Hardness in Milligrams per Liter	Degree of Hardness
0 - 35	Soft
36 - 100	Medium
100 - 150	Hard
Over 150	Extremely Hard

* Standard Units. ** Pico-curies Per Liter.

Source: Ameen, Joseph S., Community Water Systems, 1960

9. *It is not the intent of these criteria to provide for a swimming water immediately below an existing treated domestic sewage outfall.*
10. *Where common treatment is practicable, it is the policy of the Council to restrict the number of sewer outfalls to a minimum.*
11. *Tests or analytical procedures to determine compliance with standards will, insofar as practicable and applicable, be made in accordance with the methods given in the twelfth edition of "Standard Methods for the Examination of Water and Waste Water" published by the American Public Health Association, et al., or in accordance with tests or analytical procedures that have been found to be equal or more applicable.*
12. *Because of conflicting testimony, it is the intent of the Water Pollution Control Council to obtain additional information on temperatures and fisheries on waters below existing steam generating stations at Billings and Sidney on the Yellowstone River. This can probably be best accomplished by a cooperative study between the utility, State Fish and Game Department, Federal Water Pollution Control Administration and the Montana State Department of Health.*
13. *Insufficient information is available for establishing fixed sediment criteria at this time. Until standards can be set, reasonable measures, as defined by the Water Pollution Control Council, must be taken to minimize sedimentation from man's activities.*

Minimum treatment requirements set forth by the Council are:

1. *Domestic Sewage – the minimum treatment required for domestic sewage shall be secondary treatment or its equivalent with the understanding that properly designed and operated sewage lagoons will meet this requirement.*
2. *Industrial Wastes – the minimum treatment required for industrial wastes shall be secondary treatment or its equivalent.*

Definitions of the water use classifications assigned to the Columbia and Missouri Basins and the Hudson Bay drainage in Montana are:

"A–Closed" – Water supply for drinking, culinary and food processing purposes, suitable for use after simple disinfection. Public access and activities such as livestock grazing and timber harvest should be strictly controlled under conditions prescribed by the State Board of Health.

The Council has classified as "A–Closed" only those waters on which access is presently controlled by the utility owner. If other uses are permitted by the utility owner, these waters shall be reclassified "A–Open–D 1" or lower.

"A–Open–D 1" – Water supply for drinking, culinary and food processing purposes suitable for use after simple disinfection and removal of naturally present impurities. Water quality shall also be maintained suitable for the use of these waters for bathing, swimming and recreation (See "Note" below), (where these waters are used for swimming and other water contact sports, a higher degree of treatment may be required for potable water use); growth and propagation of salmonid fishes and associated aquatic life, water fowl and furbearers; agricultural and industrial water supply. Therefore, these waters shall be held suitable for "A–Open", "C", "D", "E" and "F" uses but may not necessarily be used for all such purposes.

Note: Common sense dictates that swimming and other water contact sports are inadvisable with a reasonable distance downstream from sewage treatment facility outfalls.

Waters in this class, if shown to meet the “A–Closed” criteria, may be so classified by the Council at the request of the utility owner.

All waters within the boundaries of national parks and nationally designated wilderness, wild or primitive areas in Montana are classified “A–Open–D_1” except those adjacent to developed areas such as Snyder Creek through the community of Lake McDonald and Swiftcurrent Creek below the Many Glacier Chalet, both in Glacier National Park. Also, Georgetown, Flathead and Whitefish Lakes and Lake Mary Ronan are classified as “A–Open–D_1” as are some streams presently used for domestic water supply.

“B–D_1” The quality of these waters shall be maintained suitable for drinking, culinary and food processing purposes after adequate treatment equal to coagulation, sedimentation, filtration, disinfection and any additional treatment necessary to remove naturally present impurities; bathing, swimming, and recreation (see note under “A–Open–D_1”); growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; agricultural and industrial water supply. Therefore, “B–D_1” equals “B”, “C”, “D_1”, “E” and “F”.

“B–D_2” The quality of these waters shall be maintained suitable for the uses described for “B–D_1” waters except that the fisheries use shall be described as follows:

> *“Growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers.”*

Therefore, “B–D_2” equals “B”, “C”, “D_2”, “E” and “F”.

“B–D_3” The quality of these waters shall be maintained suitable for the uses described for “B–D_1” waters except that the fisheries use shall be described as follows:

> *“Growth and propagation of non-salmonid fishes and associated acquatic life, waterfowl and furbearers.”*

Therefore, “B–D_3” equals “B”, “C”, “D_3”, “E” and “F”.

“C–D_2” The quality of these waters shall be maintained suitable for bathing, swimming and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; agricultural and industrial water supply. Therefore, “C–D_2” equals “C”, “D_2”, “E” and “F”.

“D_2” The quality of these waters shall be maintained for growth and marginal propagation of salmonid fishes and associated aquatic life, water fowl and furbearers; agricultural and industrial water supply. Therefore, “D_2” equals “D_2”, “E” and “F”.

“E” The quality of these waters shall be maintained for agricultural and industrial water supply uses and “E” shall equal “E” and “F” uses.

“F” The quality of these waters shall be maintained suitable for industrial water supply uses, other than food processing.

Sources:
1. "Montana Water Laws: A Resume," Inventory Series Report No. 5, Montana Water Resources Board, Helena, Montana, November, 1968
2. "Water Resources Survey," Flathead and Lincoln Counties, Montana, State Engineer's Office, Helena, Montana, June,1965
3. "Water Quality Criteria," "Water Use Classifications," "Policy Statements," communication from Claiborne W. Brinck, Director, Division of Environmental Sanitation, State Department of Health, Helena, Montana, May 7, 1968

APPENDIX II.

COMMUNITY WATER SYSTEM FACILITIES

ANALYSIS CRITERIA

Complete designs of safe community water systems can become extremely complicated. Each design and analysis is usually a unique problem for that individual system. For this study, a general approach must be used; however, it is realized that a more detailed study may result in somewhat different findings and proposals. The following paragraphs contain a discussion of the approach used in arriving at general design criteria used herein.

In the analysis and design of water systems, the interrelations of supply, transmission, storage, and distribution must be considered. For example, if the water supply is not adequate to meet the peak hourly demand, storage is necessary to provide a reserve for the peak periods. The size of the various portions of the system is determined by establishing the average daily demand on the system.

The determination of daily water consumption is arrived at by considering records of existing systems. Usage varies over a wide range of about one hundred gallons per capita per day (gpcpd) to six hundred gpcpd. Usages of four hundred gpcpd are very common during hot weather. The basis of analysis used, herein, is two hundred gpcpd average. The accepted nationwide average daily demand value for a community water system is 125 gallons per day per person for domestic use. Records show that practically all Montana communities exceed this amount especially during hot weather, and the two hundred gpcpd is more in line with present day demands for communities in Montana.

Well capacities and capacities of other sources of supply must be sufficient to provide water for the average requirements and additional amounts to sustain peak periods. It is felt that a water source capable of supplying the total average daily demand by operating for a twelve hour period is a suitable basis for analysis. This means that the average daily demand doubled, divided by twenty four hours per day and sixty minutes per hour, will result in a required rate of supply in gallons per minute. It is realized that this source may be required to operate more than twelve hours during high demand periods. This freedom in operation, combined with storage facilities, is intended to provide the necessary flexibility to handle low and high demand periods economically.

It is common practice to provide storage facilities with capacity equal to the supply necessary for one average day. This will provide storage for fire protection and any excess will add to the flexibility of the system. Table B shows desired storage for fire based on population. This information corresponds to requirements of the Montana Fire Rating Bureau and is taken from "Community Water Supplies" by Ameen.

During certain times of the year water consumption will exceed the average figure of two hundred gpcpd. The system analysis must be checked to determine the amount of water actually available to supply such demands. The estimated 1990 population is used for this check so that population increases are considered. Also, it is expected that the source will have to operate for more than the twelve hour period and any storage in excess of the recommended reserve for fire will be available for domestic consumption. The recommended storage for fire is shown in Table B.

It is considered that the source must produce water for an eighteen hour period. This value, times the well yield, results in a value for the amount of water that can be put into service per day. Also included is the storage not required for fire reserve. The sum of those two values divided by the 1990 population, yields the water available in gallons per capita per day. If water demand exceeds this amount, meters or some other means of controlling water usage must be employed. The above approximate approach results in an adequate amount of water being available and is considered to be the general analysis criteria which is applicable for all the communities studied.

Summary of Analysis Criteria

Average Daily Water Consumption (gpcpd)	200
Desired Output of System (gpcpd)	400
Desired Yield of Source (gpm)	$\frac{1.5 \text{ to } 2.0 \times \text{Average Daily Consumption}}{24 \text{ Hour/Day} \times 60 \text{ Minute/Hour}}$
Desired Storage	One Average Day's Supply

TABLE B

Desired Storage For Fire

Population	Storage (Gals.)	Population	Storage (Gals.)
200	26,800	2,200	92,800
400	33,400	2,400	99,400
600	40,000	2,600	106,000
800	46,600	2,800	112,600
1,000	53,200	3,000	119,200
1,200	59,800	3,500	135,800
1,400	66,400	4,000	152,400
1,600	73,000	4,500	169,000
1,800	79,600	5,000	185,600
2,000	86,200	5,500	202,200

Source: "Community Water Systems" by Ameen.

APPENDIX III.

COMMUNITY SEWER SYSTEM FACILITIES

ANALYSIS CRITERIA

The Montana State Department of Health has adopted the "Ten State Standards" as the criteria for the design of the various elements of the sewer system. Proposals contained herein are based on the recommendations of these standards.

Wastewater stabilization ponds are considered to be the most suitable means of sewage treatment for most smaller communities. The recommended sizes are derived from the criteria of one acre per one hundred population. This criteria is adequate if normal domestic sewage is encountered for all cases; however, more detailed study and analysis is required for final design.

Sewage collection and outfall mains are to be a minimum of eight inches in diameter according to the "Ten State Standards". This minimum is established since reasonably maintenance free systems will result. In many small communities, the sewage flow does not justify this size; however, the possibility of plugging is minimized.

Capacities for the various size lines are determined for minimum grades with the pipe flowing two thirds full and are shown in Table C. Where sewage force mains are required, a minimum of four inch pipe is proposed. Larger lines are sized according to anticipated flow.

Criteria for the sewage flows used in this study are as follows:

Average sewage flow	100 gpcpd
Peak sewage flow (laterals)	400 gpcpd
Peak sewage flow (trunk and outfall)	250 gpcpd
Treatment facilities	100 gpcpd

The nominal determination of pond size is based on the following:

$$\frac{100 \text{ gpcpd} \times 180 \text{ day stor.} \times 7.5 \text{ gal/cu ft}}{5\text{—ft water depth} \times 43{,}560 \text{ sq ft/acre}} = \frac{\text{one acre per}}{100 \text{ people}}$$

TABLE C

Average Capacity of Lines*

Pipe Diameter (inches)	Average Flow (gpm)	Population Equivalent (400 gpcpd flow)
6	110	390
8	200	720
10	320	1,150
		(250 gpcpd flow)
12	510	2,920
15	780	4,480
18	1,080	6,220
24	1,870	10,800

* Flowing two thirds full at minimum grade

PREFACE

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Land use was obtained by field surveys, supplemented and checked by aerial photography during 1969 and 1970.

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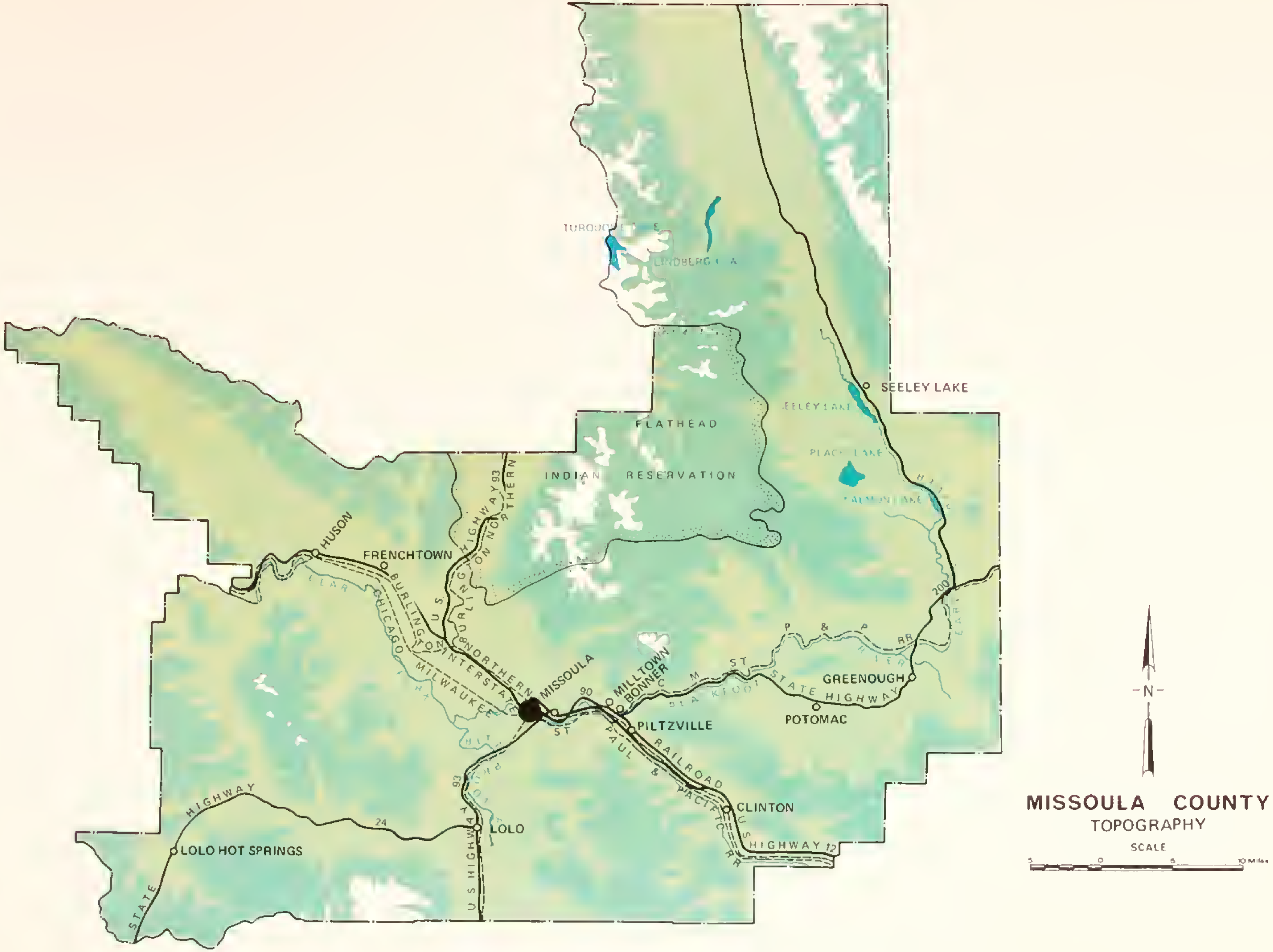
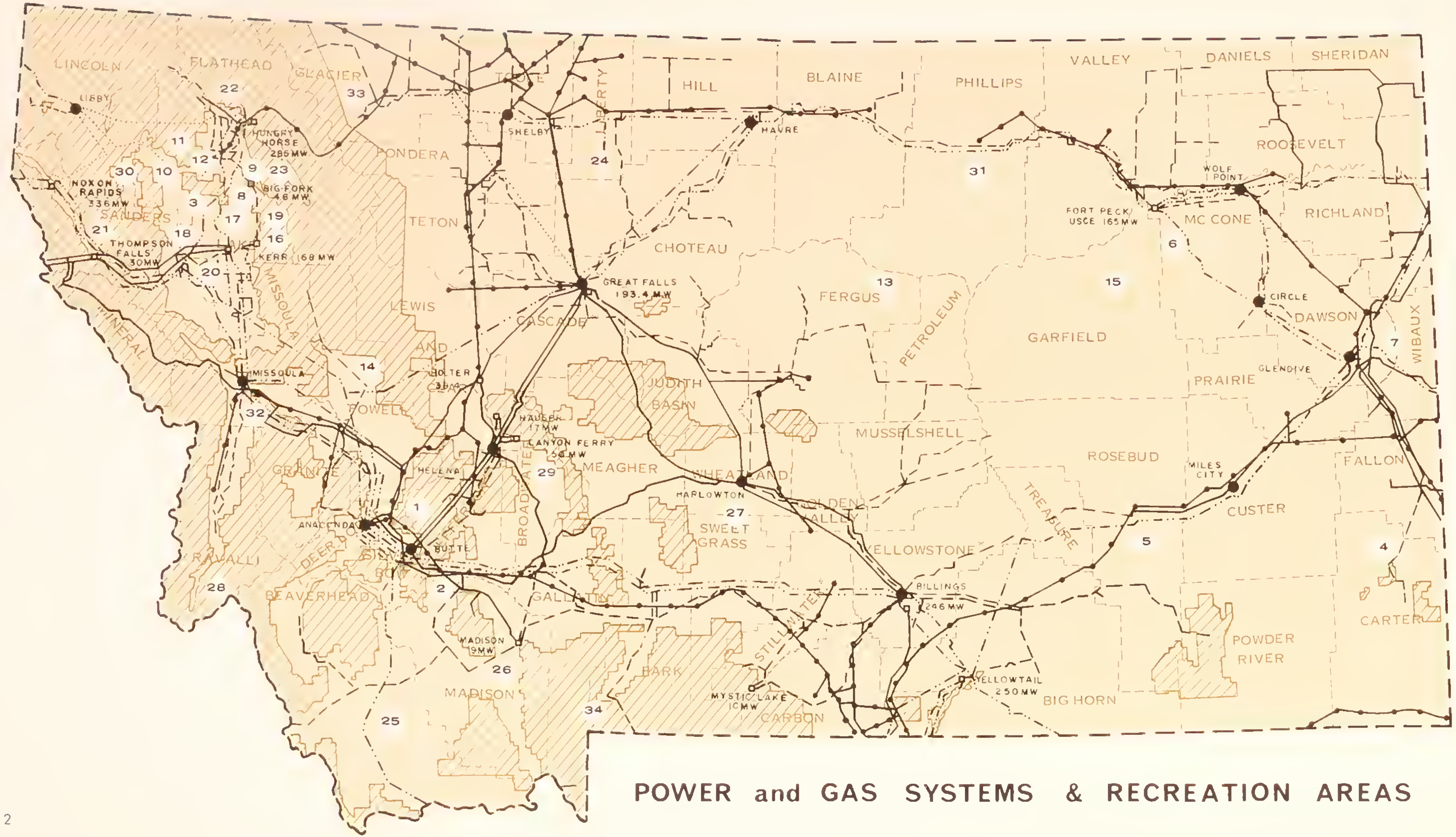


MISSOULA COUNTY

TOPOGRAPHY

MAP 1



POWER and GAS SYSTEMS & RECREATION AREAS

MAP 2

COUNTY MAP
GENERAL RELIEF

LEGEND

● CITIES-TOWNS

○ COUNTY SEAT

ROADS-HIGHWAYS
STATE HIGHWAY U. S. HIGHWAY

RAILROADS

STREAMS-LAKES

COUNTY BOUNDARY

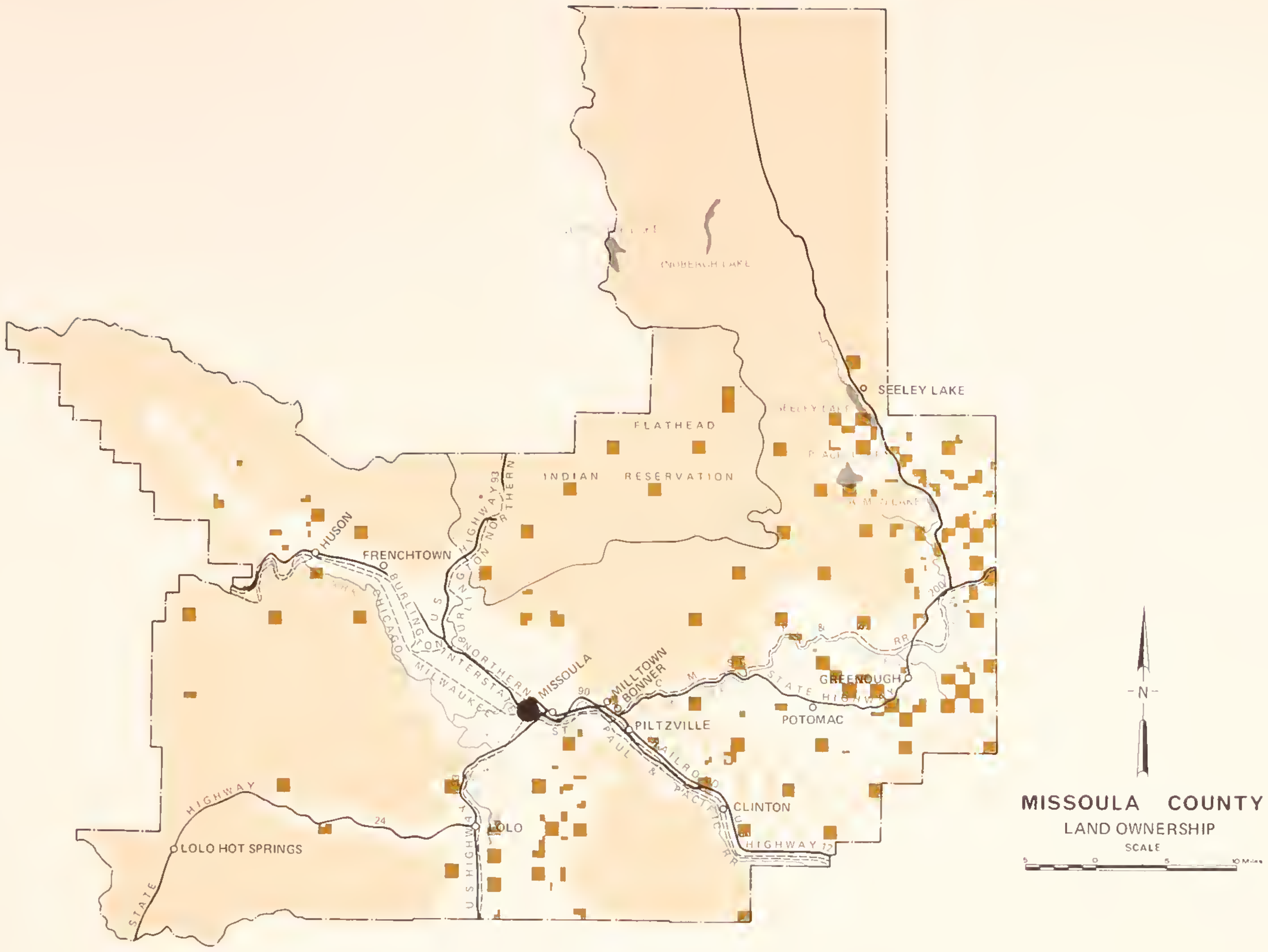
INDIAN RESERVATION

0-3,000 FT. ELEVATION

3-5,000 FT. ELEVATION

5-7,000 FT. ELEVATION

OVER 7,000 FT. ELEVATION



MISSOULA COUNTY

LAND OWNERSHIP

MAP 3

LEGEND

MAJOR STATE-WIDE COVERAGE

POWER AND GAS SYSTEMS

☐ POWER PLANT (IN MEGAWATTS)

- - - - 1 to 50 KILOVOLTS

—— 51 to 100 KILOVOLTS

-·-·- 101+ KILOVOLTS

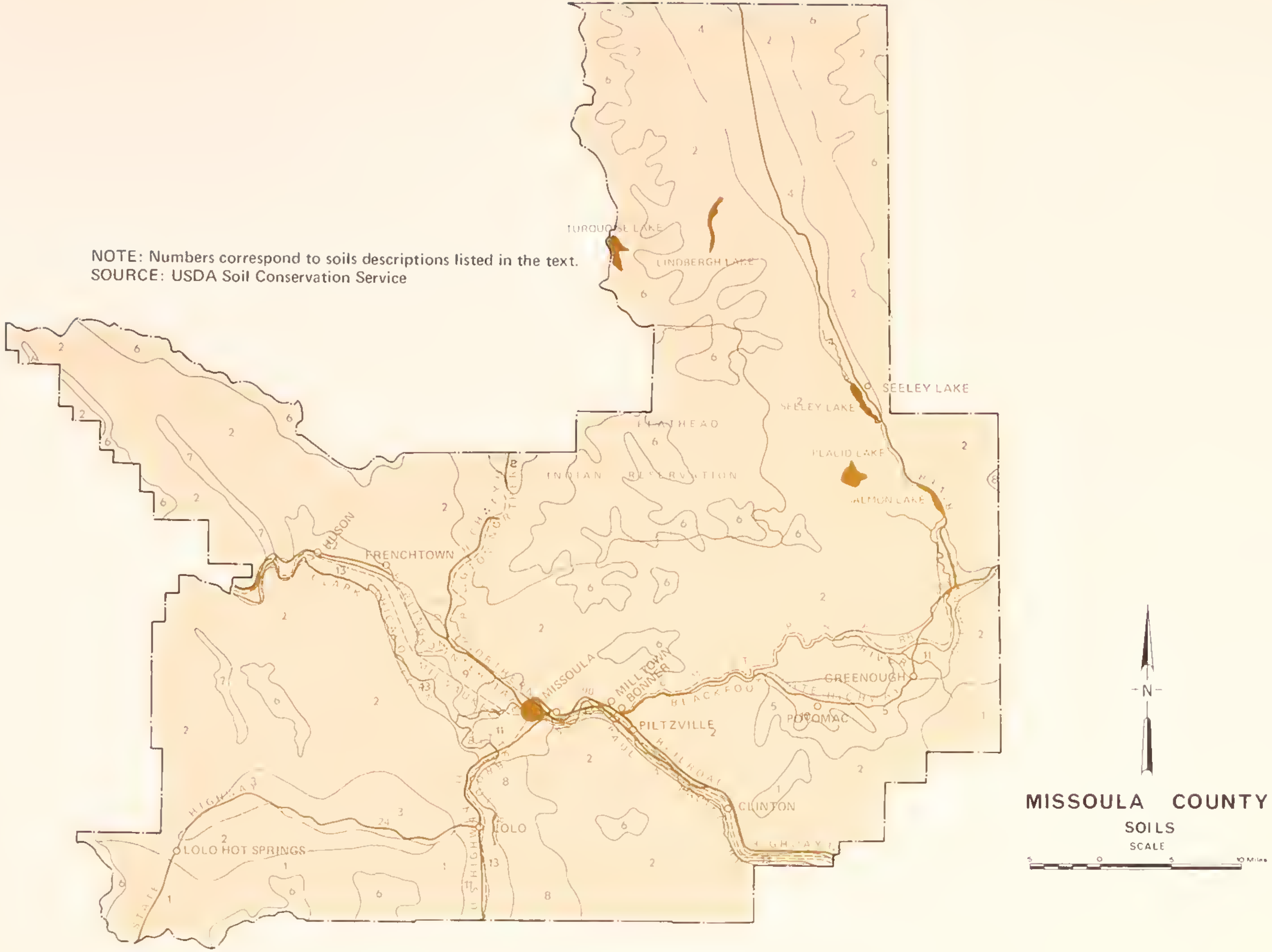
····· PROPOSED LINES

-•-•- GAS LINES

RECREATION AREAS

1. LOST CREEK STATE PARK
2. LEWIS AND CLARK CAVERNS STATE PARK
3. LAKE MARY RONAN STATE PARK
4. MEDICINE ROCKS STATE PARK
5. ROSEBUD STATE PARK
6. ROCK CREEK STATE PARK
7. MAKOSHIKA STATE PARK
8. WEST SHORE STATE PARK
9. WOODS BAY STATE PARK
10. BITTERROOT LAKE STATE PARK
11. ASHLEY LAKE STATE PARK
12. LONE PINE STATE PARK
13. JAMES KIPP STATE PARK
14. HOOPER MEMORIAL STATE PARK
15. HELL CREEK STATE PARK
16. FINLEY POINT STATE PARK
17. ELMO STATE PARK
18. FLATHEAD LAKE STATE PARK
19. YELLOW BAY STATE PARK
20. WALSTAD MEMORIAL PARK
21. THOMPSON FALLS STATE PARK
22. WHITEFISH LAKE STATE PARK
23. WAYFARERS RECREATION AREA
24. TIBER RESERVOIR RECREATION AREA
25. CLARK CANYON RESERVOIR RECREATION AREA
26. ENNIS RECREATION AREA
27. DEADMAN'S BASIN RESERVOIR RECREATION AREA
28. PAINTED ROCKS RESERVOIR RECREATION AREA
29. CANYON FERRY RECREATION AREA
30. LOGAN PARK RECREATION AREA
31. NELSON RESERVOIR RECREATION AREA
32. BEAVERTAIL HILL RECREATION AREA
33. GLACIER NATIONAL PARK
34. YELLOWSTONE NATIONAL PARK

▨ NATIONAL FORESTS



NOTE: Numbers correspond to soils descriptions listed in the text.
SOURCE: USDA Soil Conservation Service

MISSOULA COUNTY

SOILS

SCALE

MAP 4

COUNTY MAP
LAND OWNERSHIP

LEGEND

● CITIES-TOWNS

○ COUNTY SEAT

ROADS-HIGHWAYS
STATE HIGHWAY U. S. HIGHWAY

— — —· RAILROADS

STREAMS-LAKES

—·—·—· COUNTY BOUNDARY

INDIAN RESERVATION

▭ PRIVATELY OWNED LAND

▬ STATE OWNED LAND

▭ FEDERAL OWNED LAND

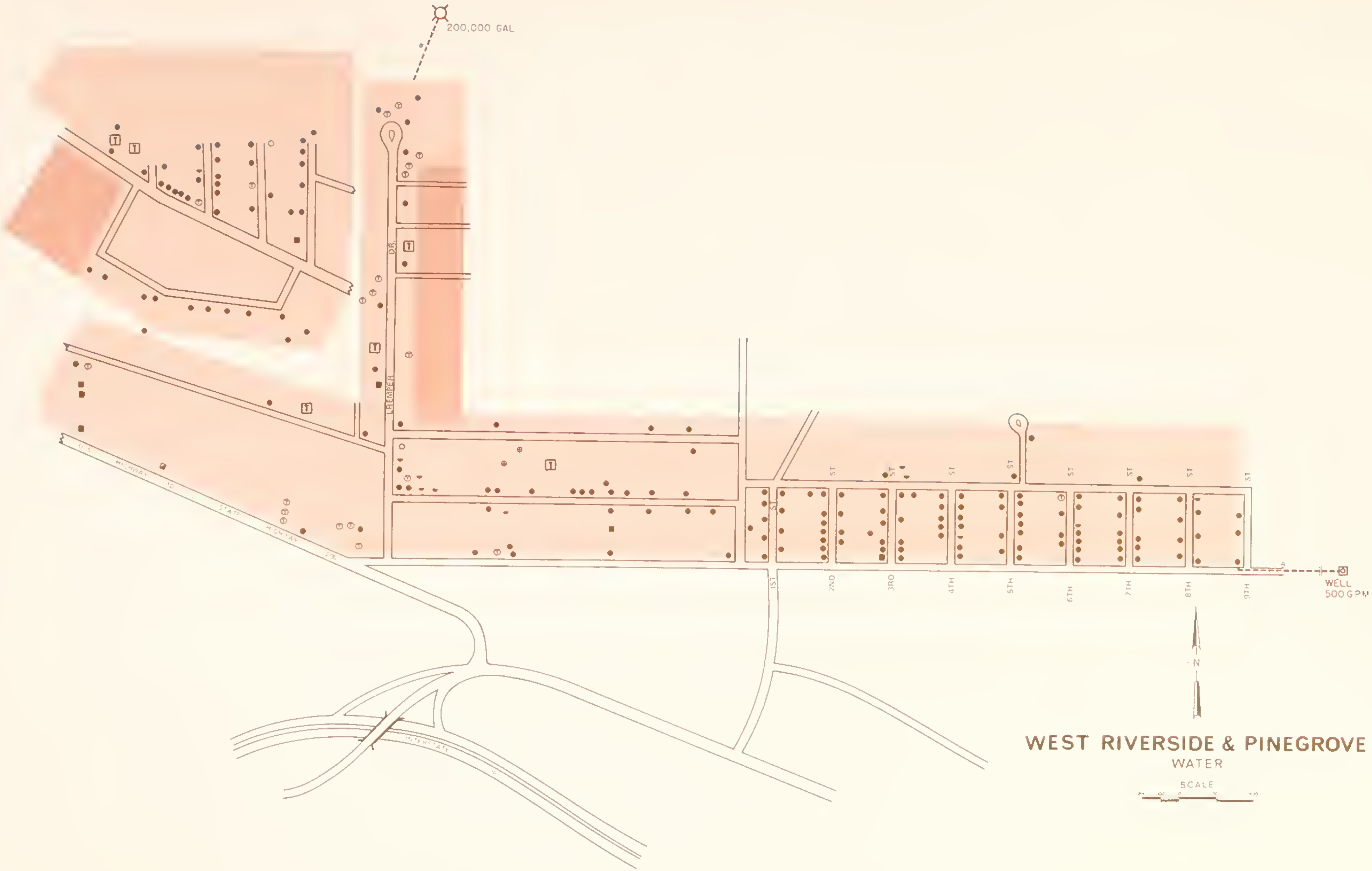
CITIES MAP LEGEND

LAND USE

●	SINGLE RESIDENCE
◒	DILAPIDATED RESIDENCE
Ⓣ	SINGLE TRAILER RESIDENCE
⊕	MULTIPLE RESIDENCE
○	APARTMENTS
🅃	TRAILER COURT
■	COMMERCIAL BUILDING
◪	HOTEL-MOTEL
△	PUBLIC BUILDING
⬡S	SCHOOL
⬢	CHURCH
⊞	HOSPITAL
✹	INDUSTRIAL
🄴	GRAIN ELEVATOR

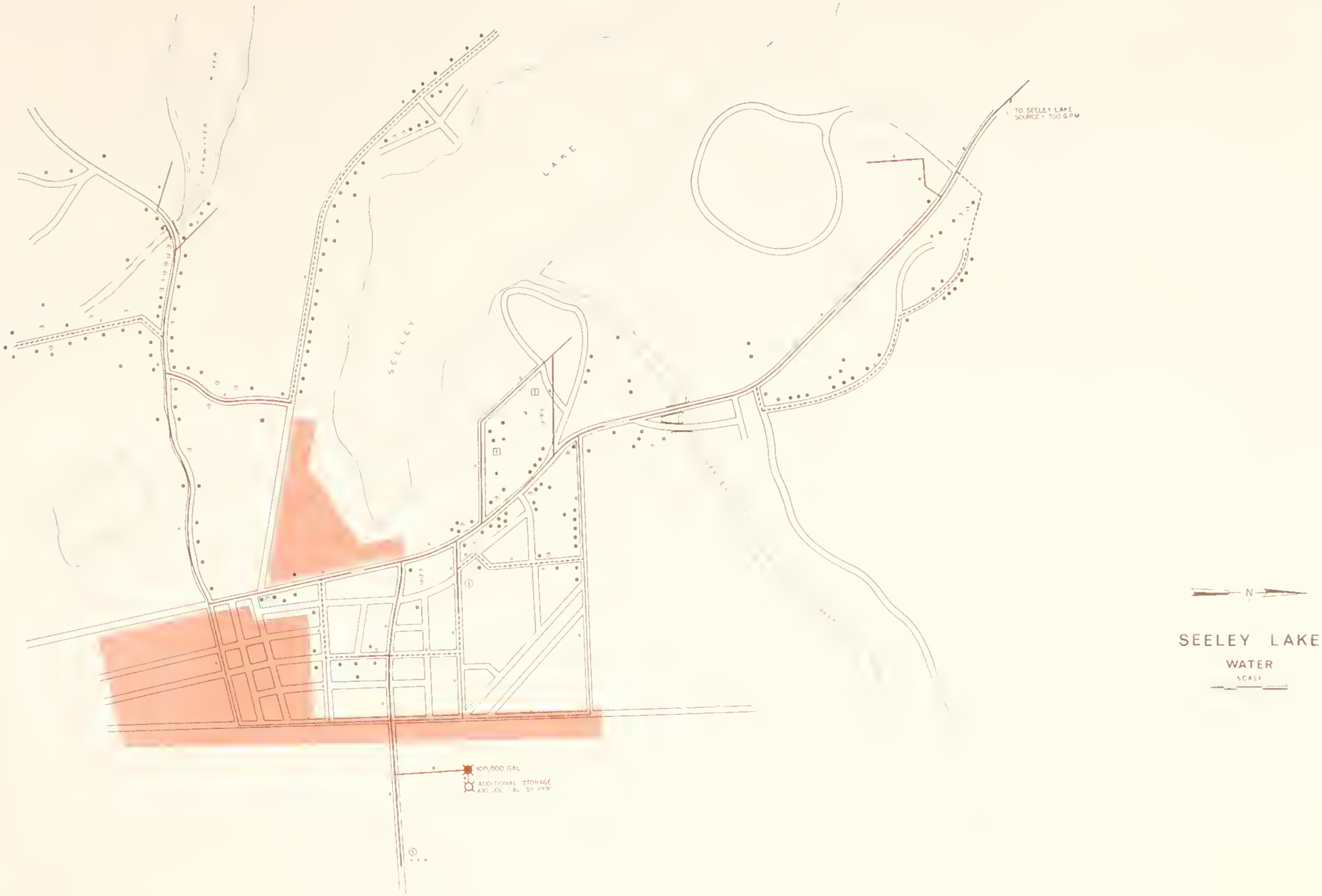
WATER and SEWER SYSTEMS

—6—	EXISTING LINES AND SIZES
- - - - -	PROPOSED LINES 5-10 YEAR
··········	PROPOSED LINES 10-20 YEAR
—◀—	EXISTING LIFT STATION
- -◁- -	PROPOSED LIFT STATION
●	EXISTING WATER STORAGE TANK
○	PROPOSED WATER STORAGE TANK
—▣	EXISTING WATER SOURCE
- -▣	PROPOSED WATER SOURCE
—□	EXISTING TREATMENT FACILITIES
- -□	PROPOSED TREATMENT FACILITIES
🟥	SERVICE AREA 1970-1980
🟥	SERVICE AREA BY 1990



WEST RIVERSIDE & PINEGROVE
WATER

MAP 5

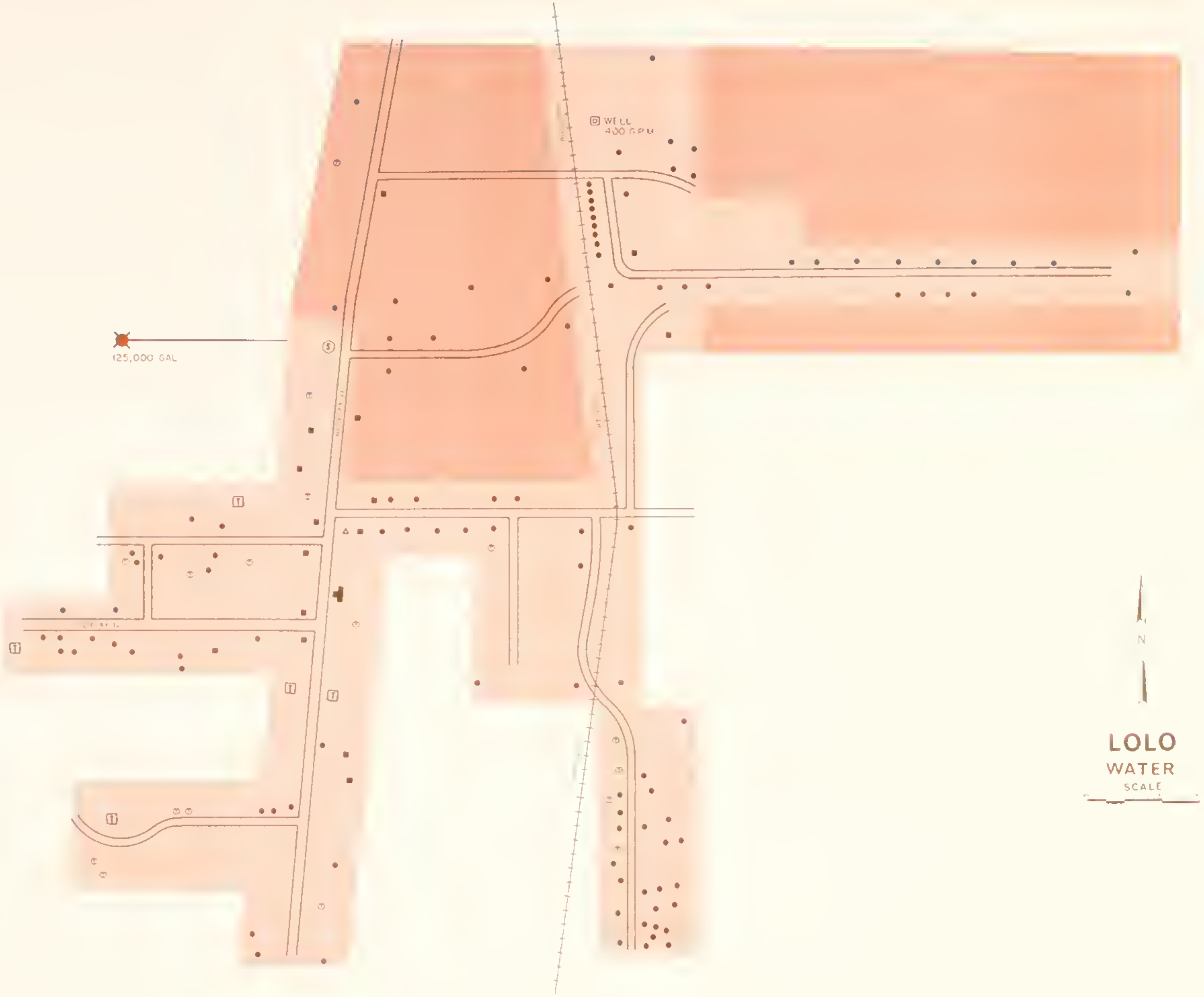


SEELEY LAKE

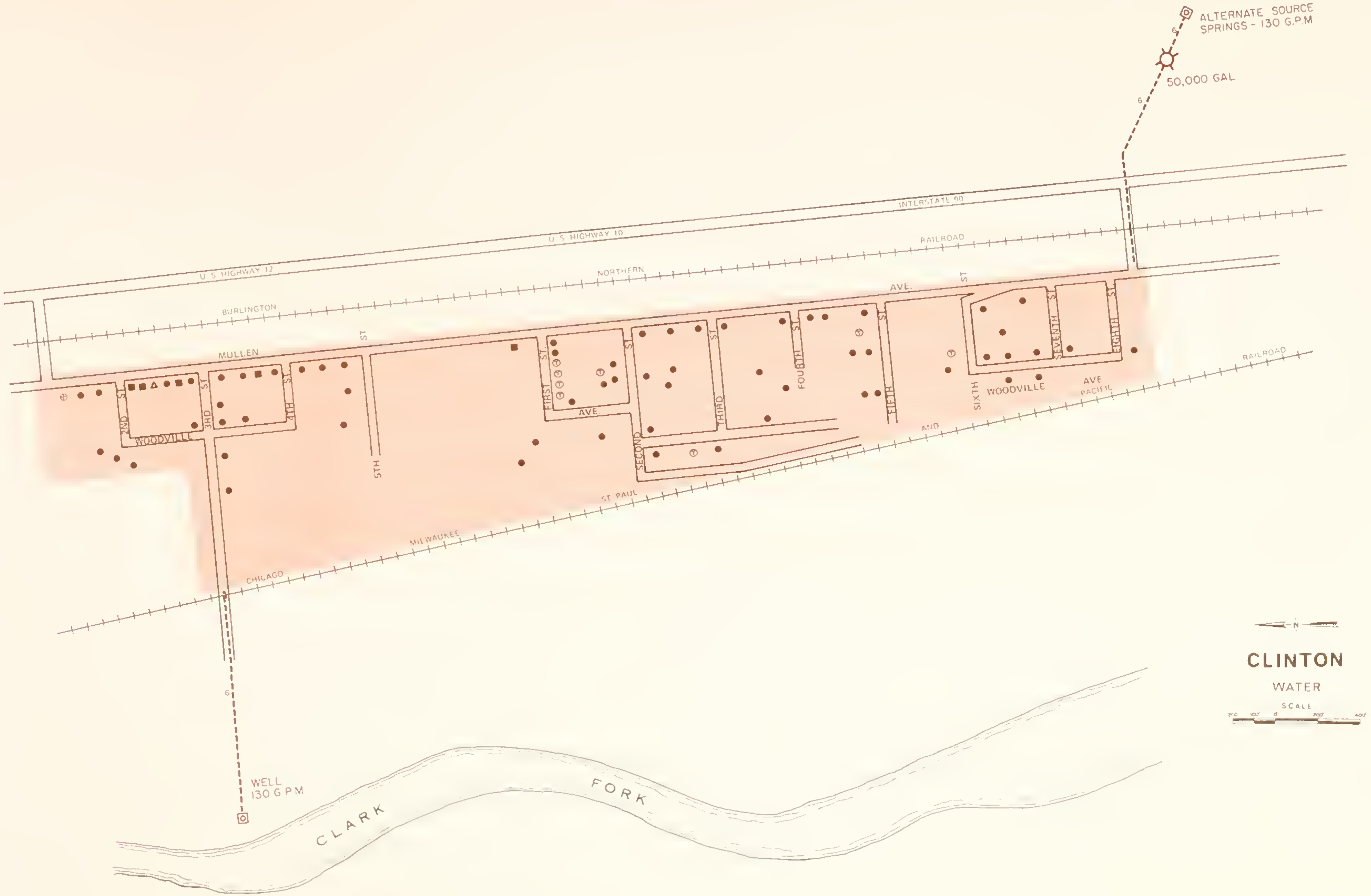
WATER

SCALE

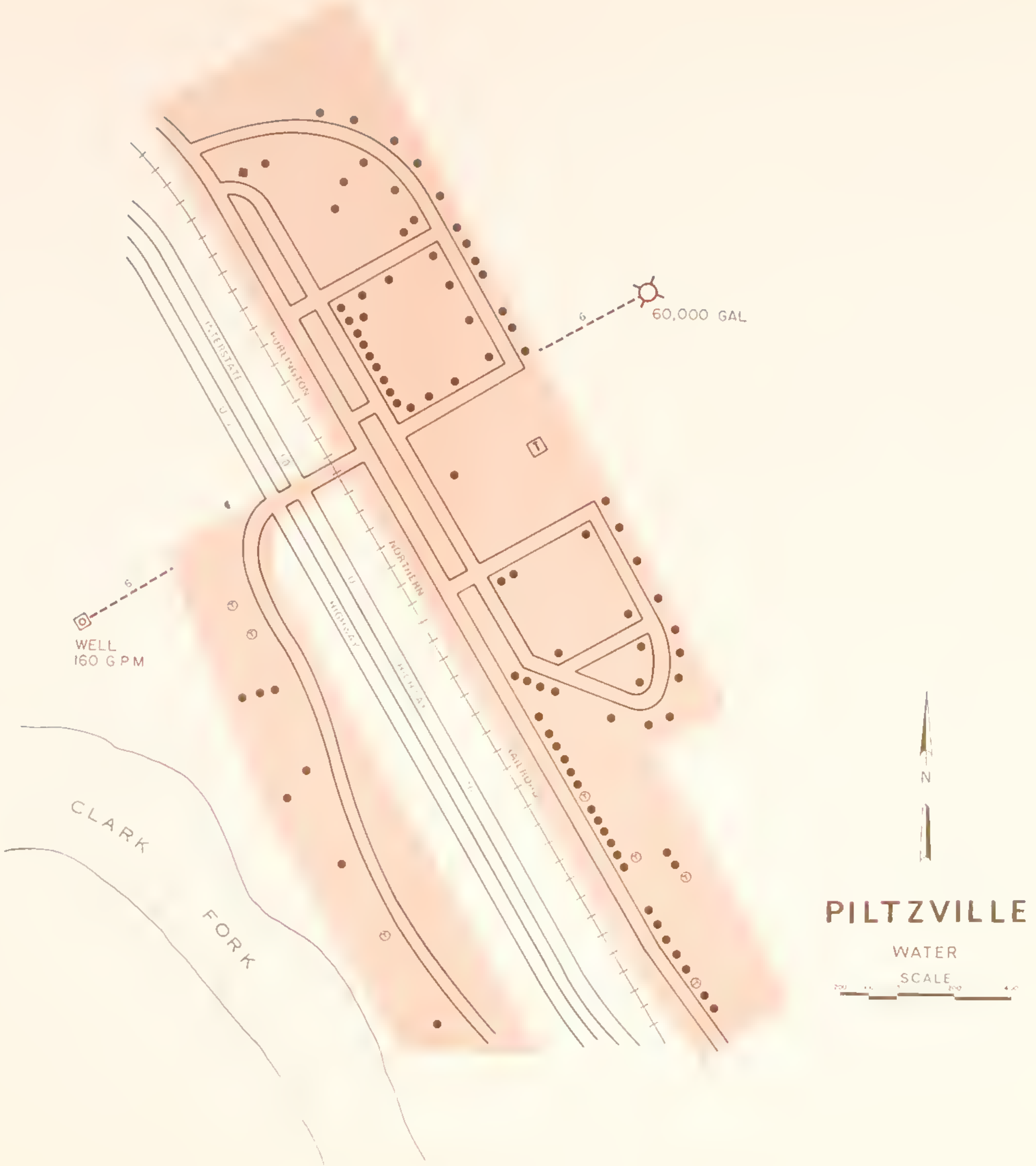
MAP 6



MAP 7


ALTERNATE SOURCE
SPRINGS - 130 G.P.M
50,000 GAL
6
6
INTERSTATE 90
U.S. HIGHWAY 10
U.S. HIGHWAY 12
NORTHERN
RAILROAD
BURLINGTON
MULLEN
AVE.
ST
2ND ST
3RD ST
4TH ST
5TH ST
WOODVILLE
FIRST ST
AVE
SECOND
THIRD ST
FOURTH ST
FIFTH ST
SIXTH ST
SEVENTH ST
EIGHTH ST
WOODVILLE
AVE
PACIFIC
AND
RAILROAD
ST PAUL
MILWAUKEE
CHICAGO
6
WELL
130 G.P.M
CLARK FORK
N
CLINTON
WATER
SCALE

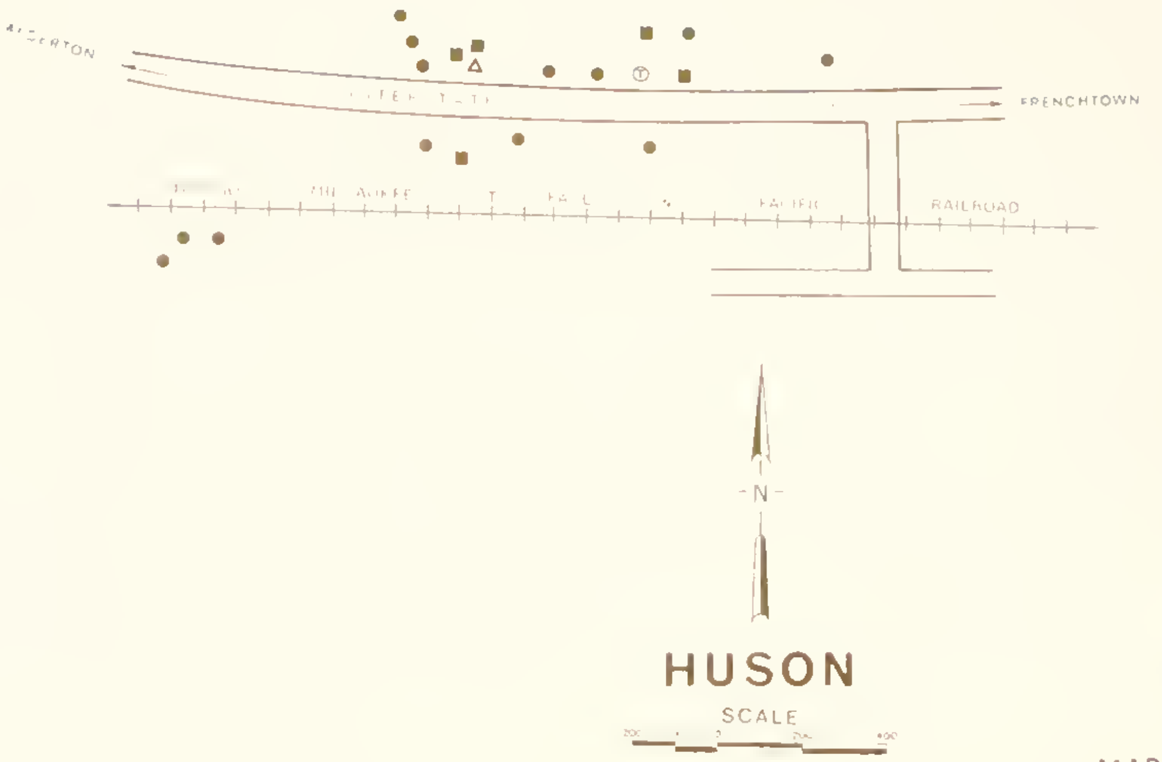
MAP 8



PILTZVILLE

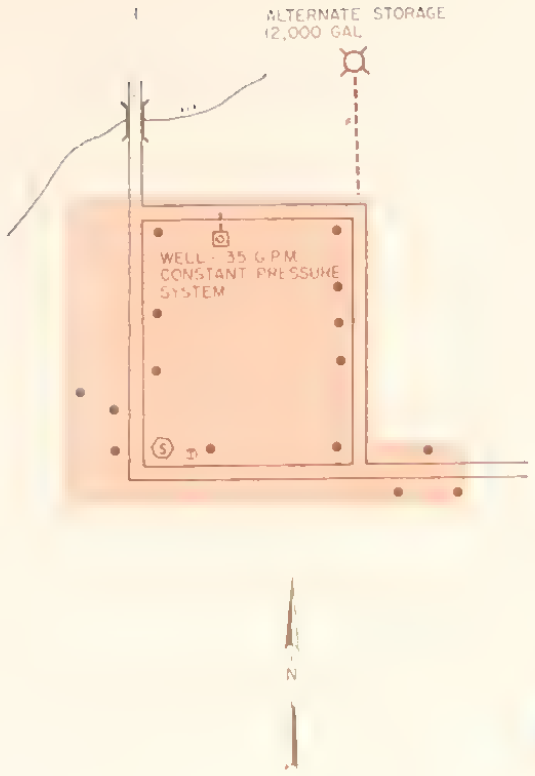
WATER

MAP 9



HUSON

MAP 10

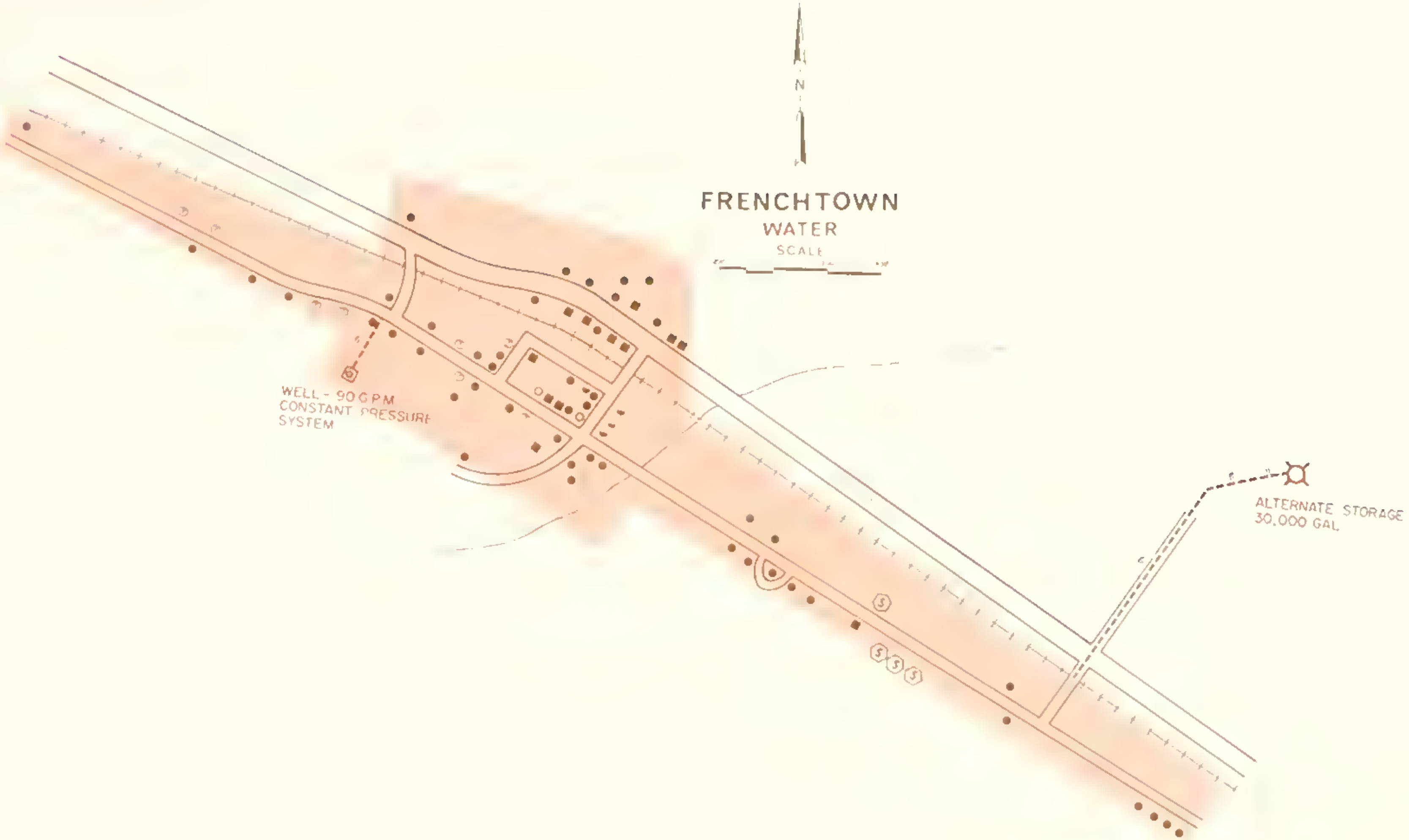


POTOMAC
WATER
SCALE

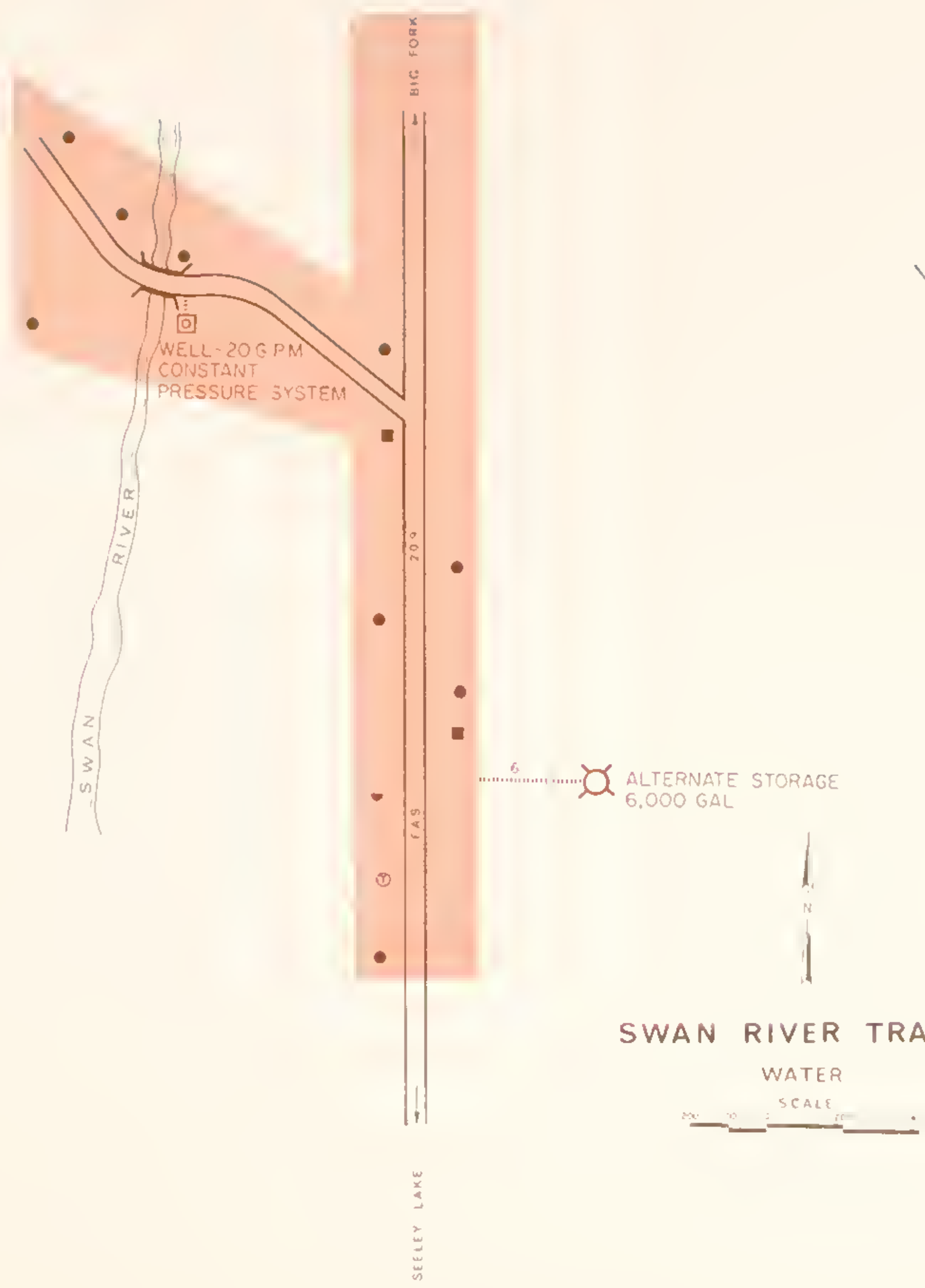
MAP 12

LOLO HOT SPRINGS
SCALE

MAP 11



MAP 13

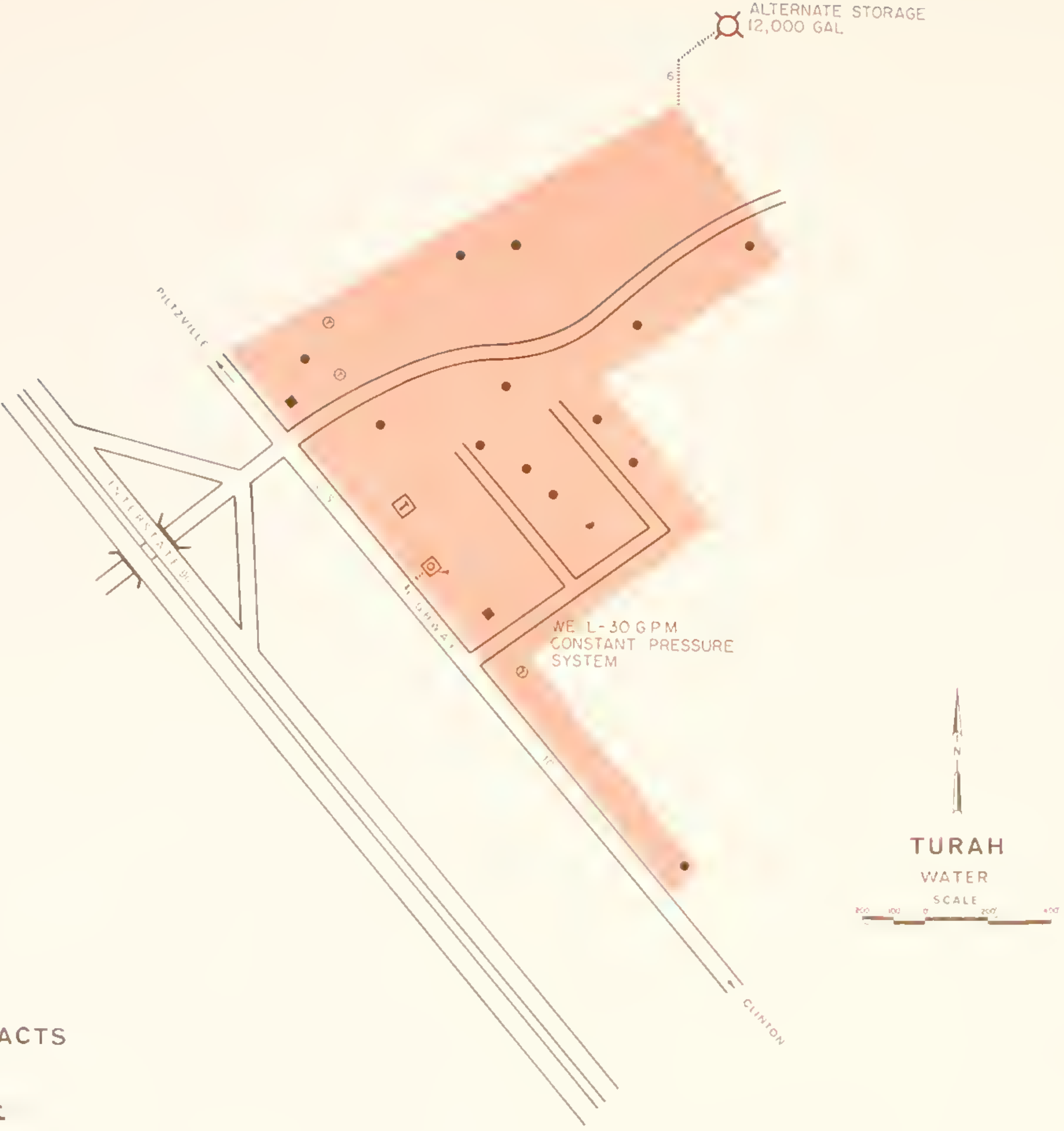


SWAN RIVER TRACTS

WATER

SCALE

MAP 14

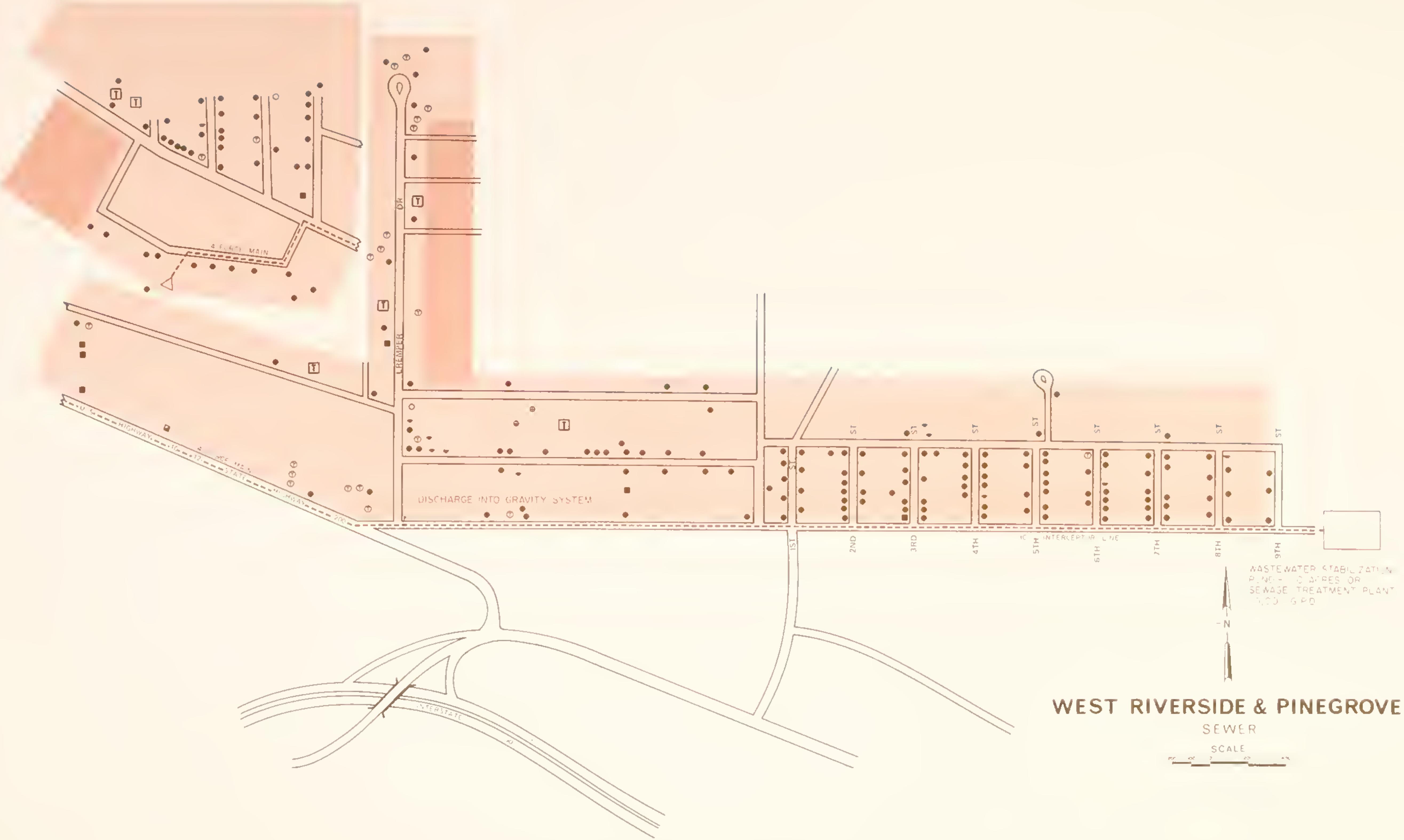


TURAH

WATER

SCALE

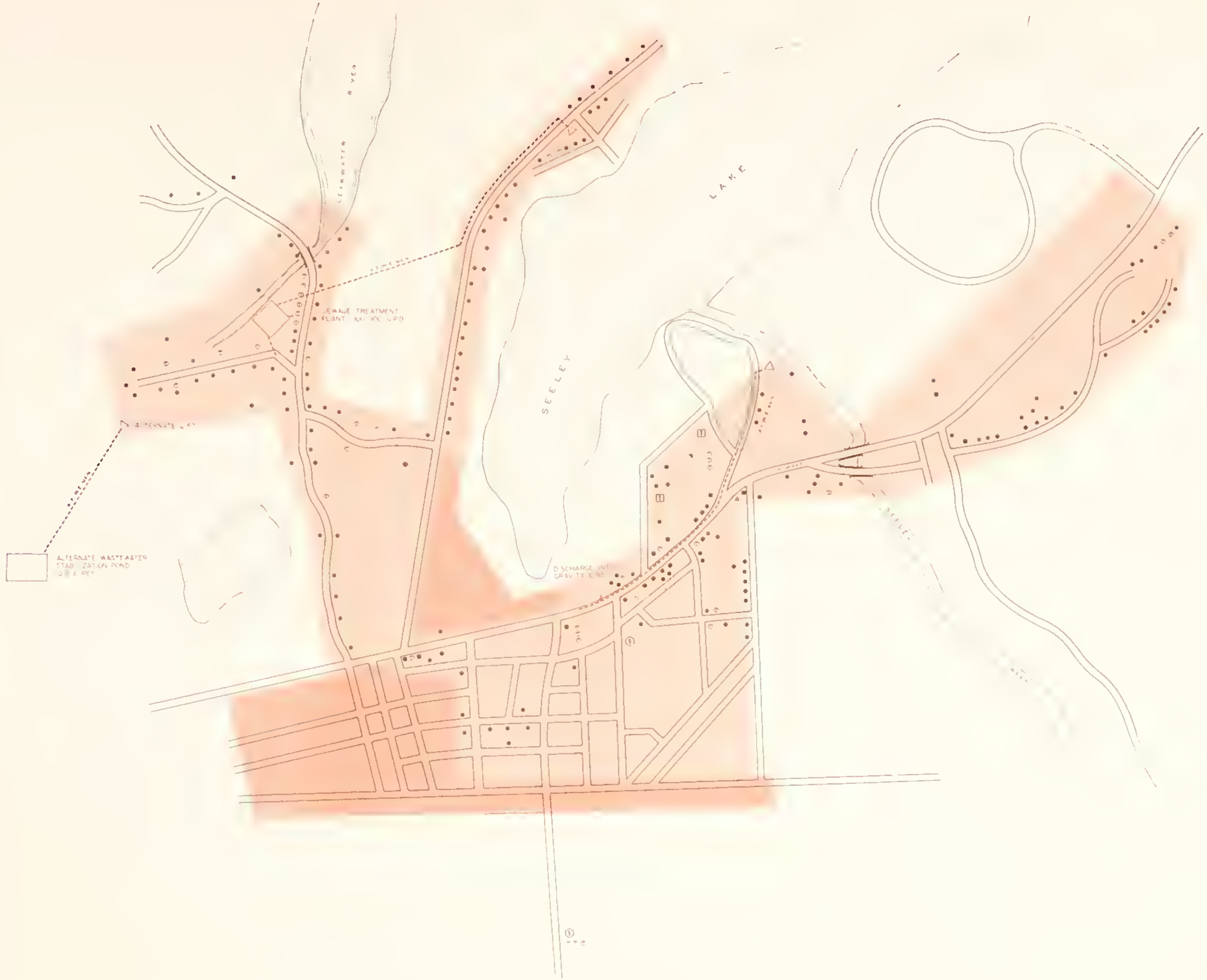
MAP 15



WEST RIVERSIDE & PINEGROVE

SEWER

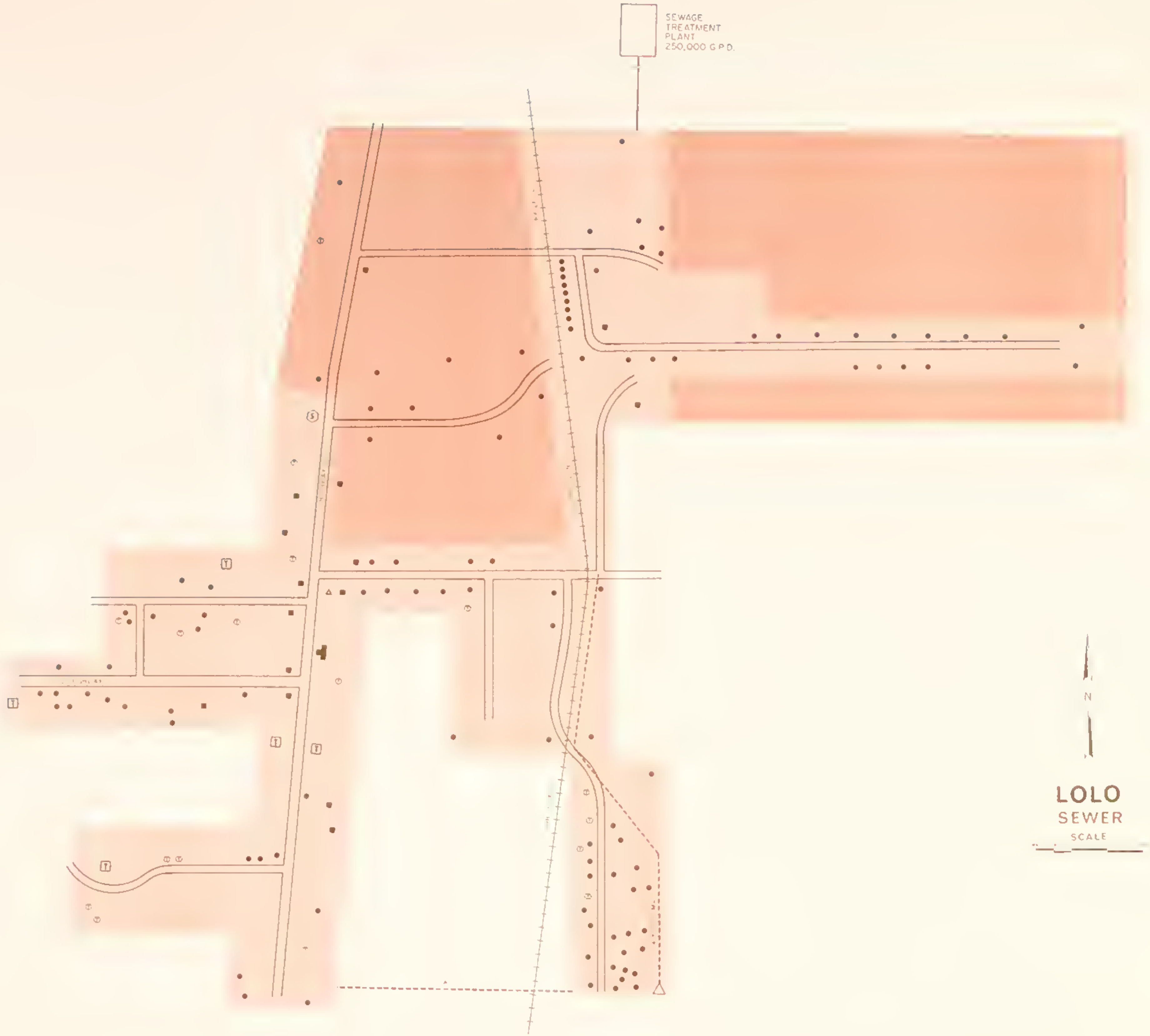
MAP 16


CLEARWATER RIVER
SEELEY LAKE
SEWAGE TREATMENT PLANT
ALTERNATE WASTEWATER STABILIZATION POND
DISCHARGE INTO GRAVITY LINE
N
SCALE

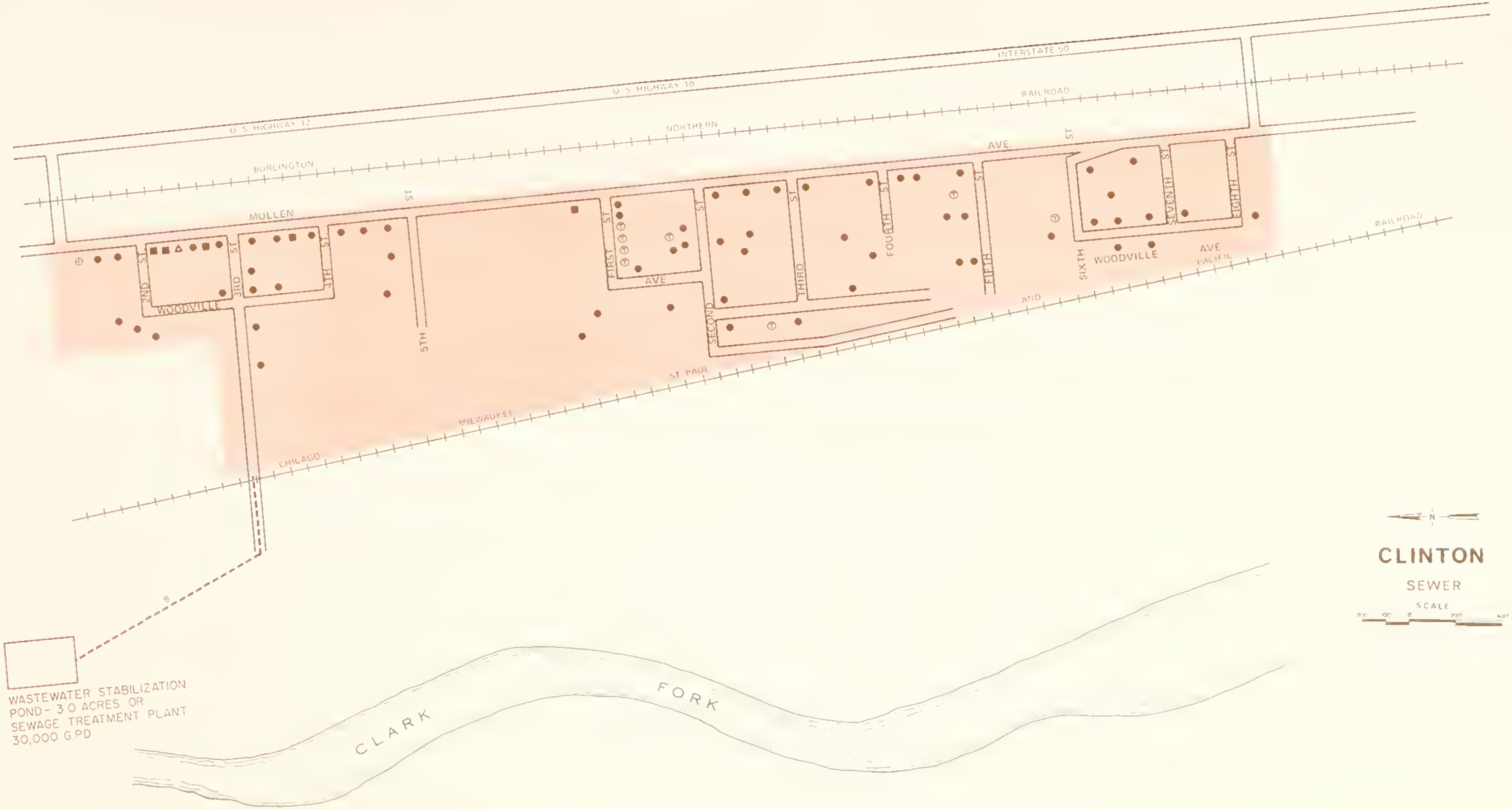
SEELEY LAKE

SEWER

MAP 17



MAP 18

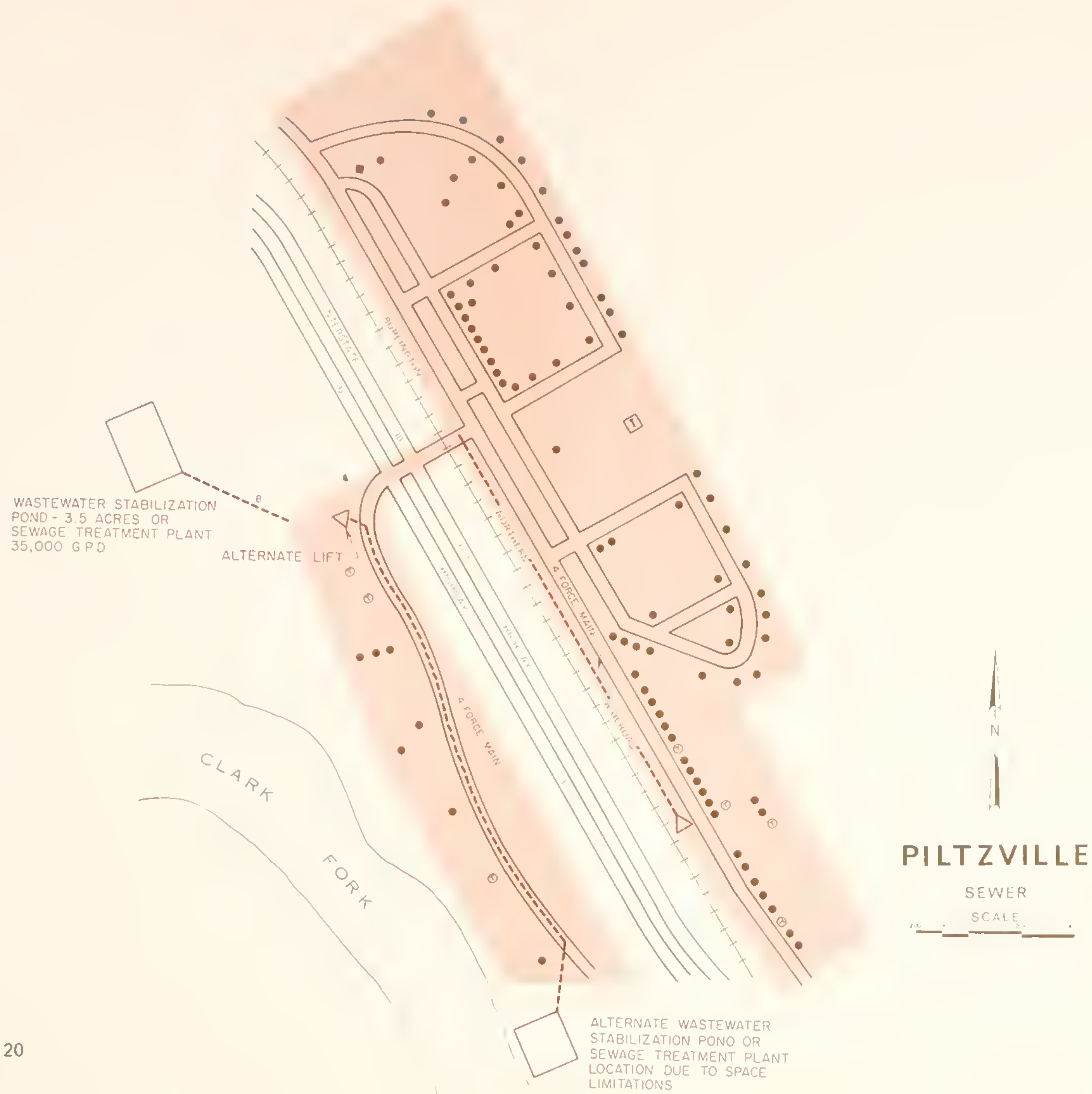


WASTEWATER STABILIZATION
POND - 3.0 ACRES OR
SEWAGE TREATMENT PLANT
30,000 G.P.D

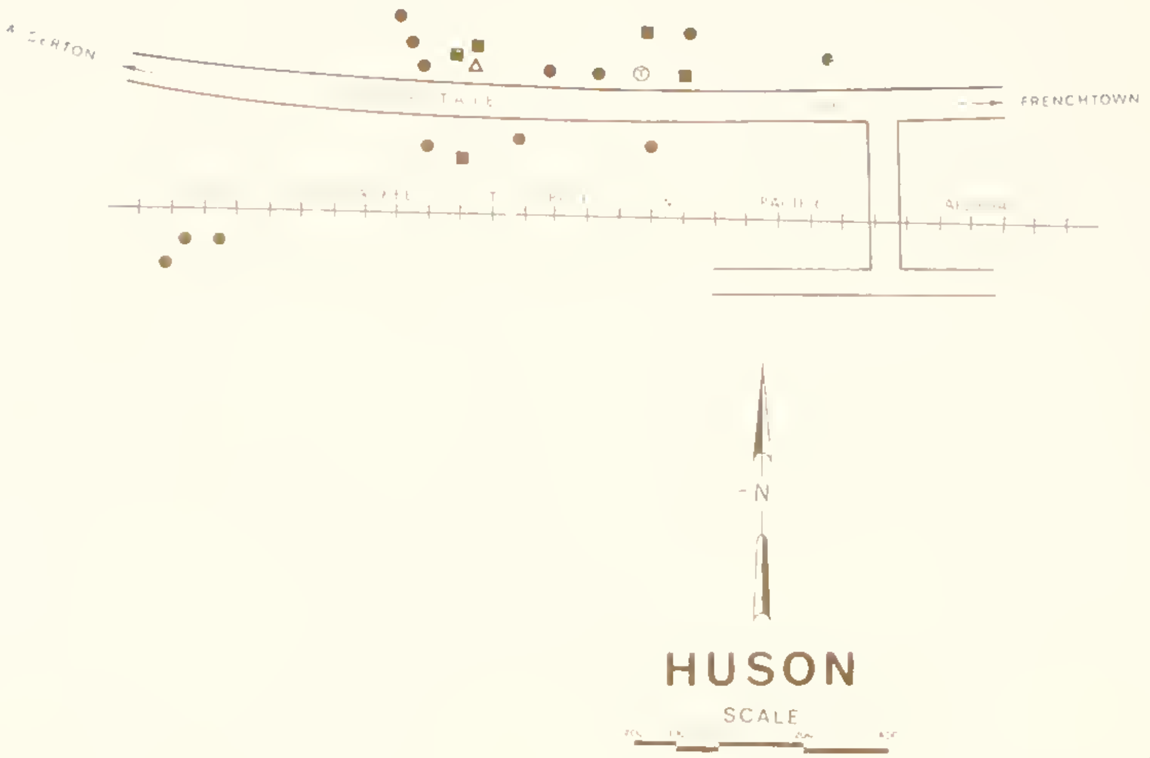
CLINTON

SEWER

MAP 19


WASTEWATER STABILIZATION POND - 3.5 ACRES OR SEWAGE TREATMENT PLANT 35,000 G.P.D.
ALTERNATE LIFT
8
4 FORCE MAIN
NORTHERN
4 FORCE MAIN
CLARK
FORK
ALTERNATE WASTEWATER STABILIZATION POND OR SEWAGE TREATMENT PLANT LOCATION DUE TO SPACE LIMITATIONS
N
PILTZVILLE
SEWER
SCALE

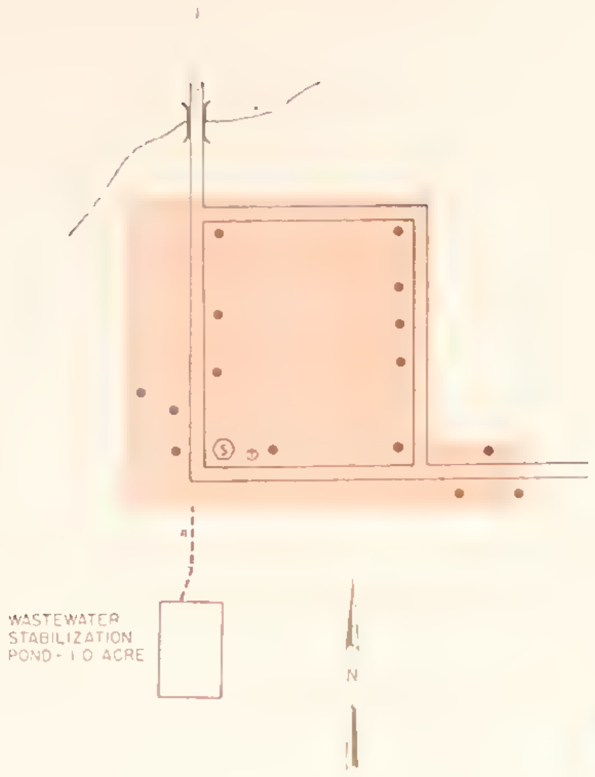
MAP 20


FRENCHTOWN
N
HUSON
SCALE

MAP 21

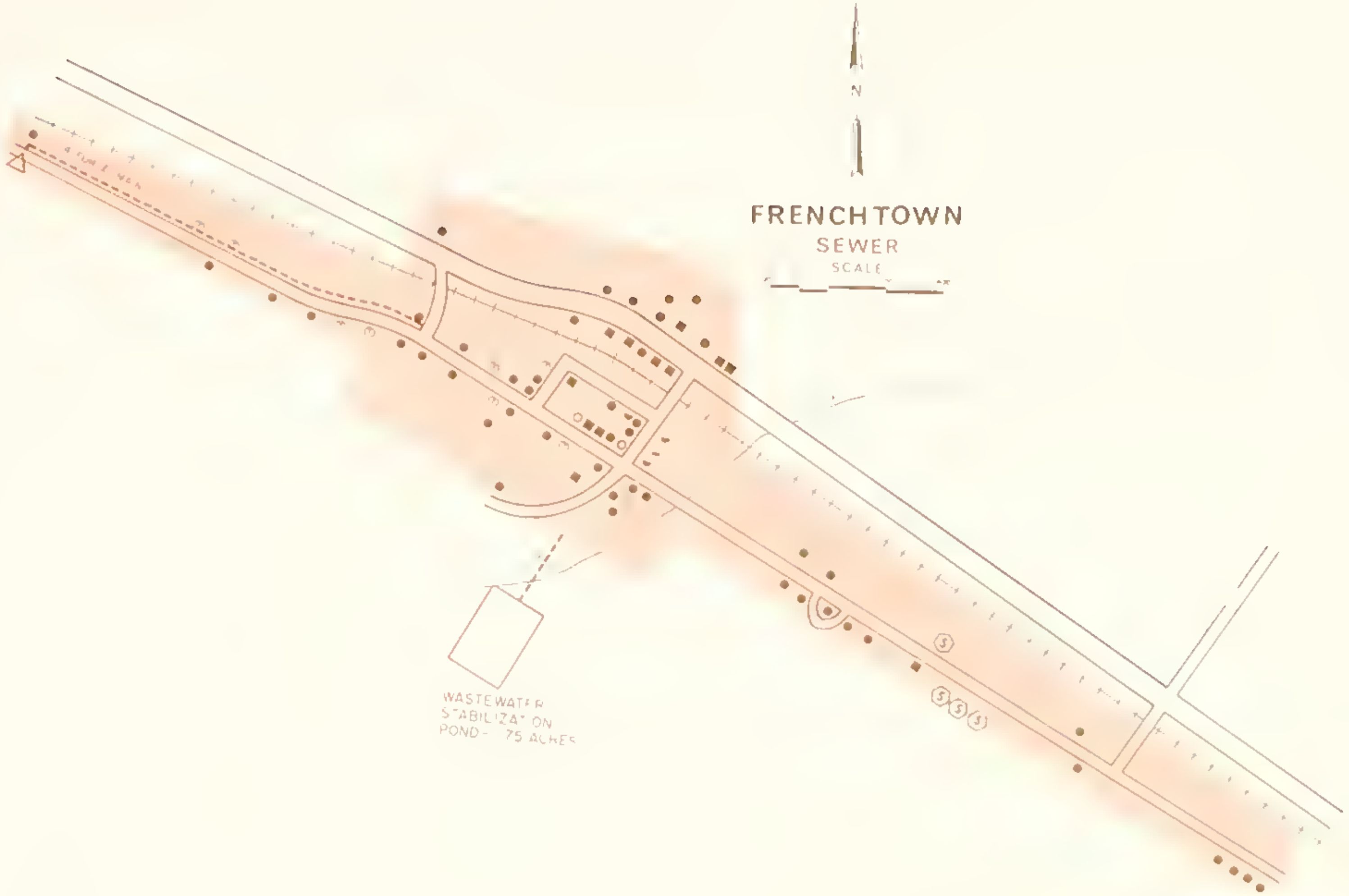
LOLO HOT SPRINGS
SCALE

MAP 22



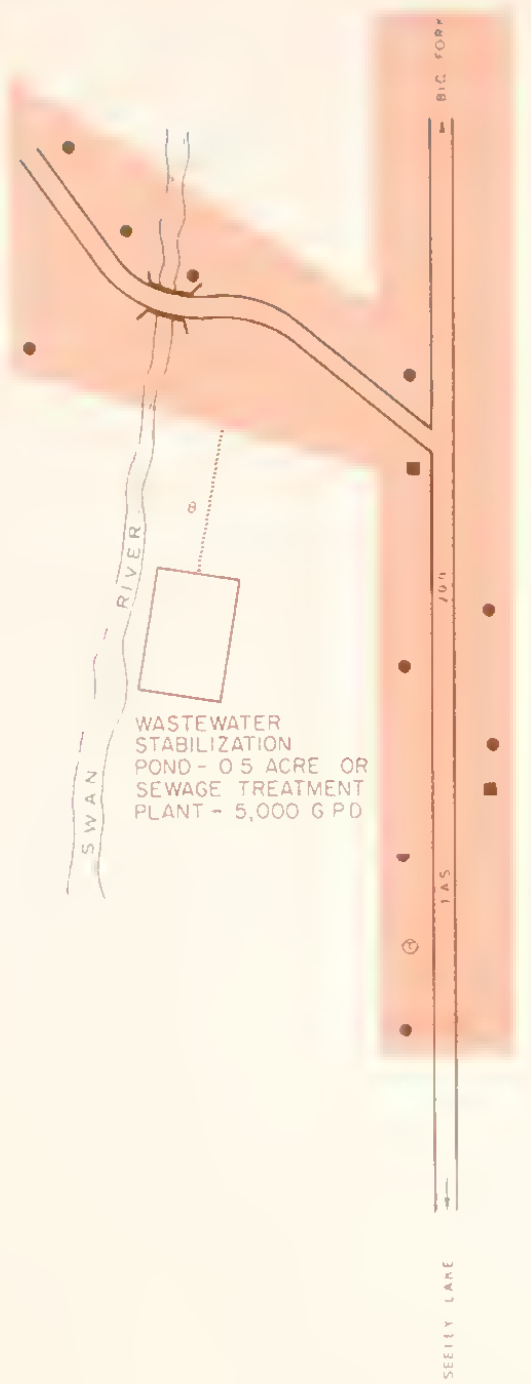
POTOMAC
SEWER
SCALE

MAP 23



FRENCHTOWN
SEWER
SCALE

MAP 24

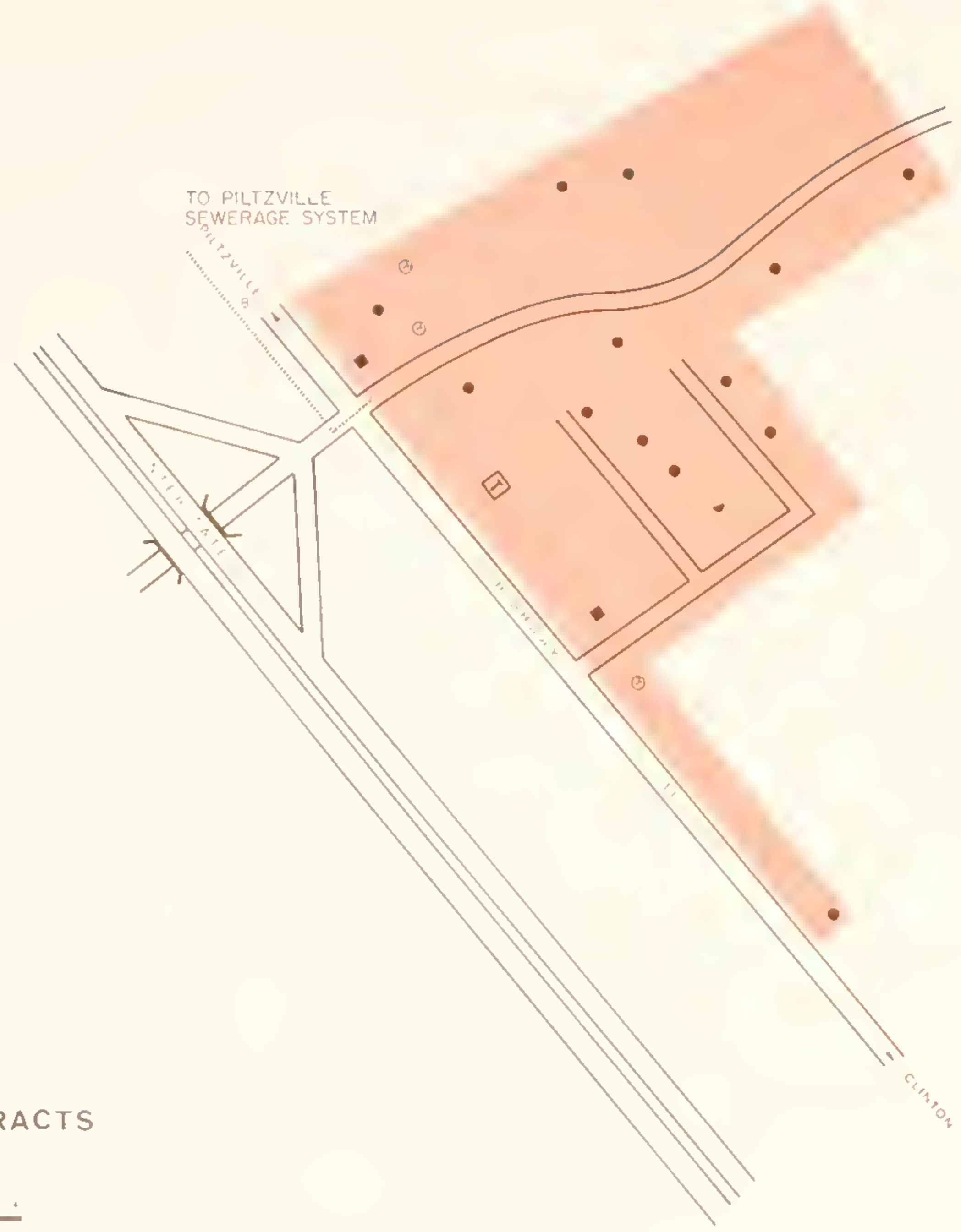

BIG FORK
SWAN RIVER
8
WASTEWATER STABILIZATION POND - 0.5 ACRE OR SEWAGE TREATMENT PLANT - 5,000 G.P.D.
209
1AS
SEELEY LAKE

SWAN RIVER TRACTS

SEWER

SCALE

MAP 25



TURAH

SEWER

SCALE

MAP 26

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MINERAL COUNTY

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MINERAL COUNTY

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Map 10 Haugan
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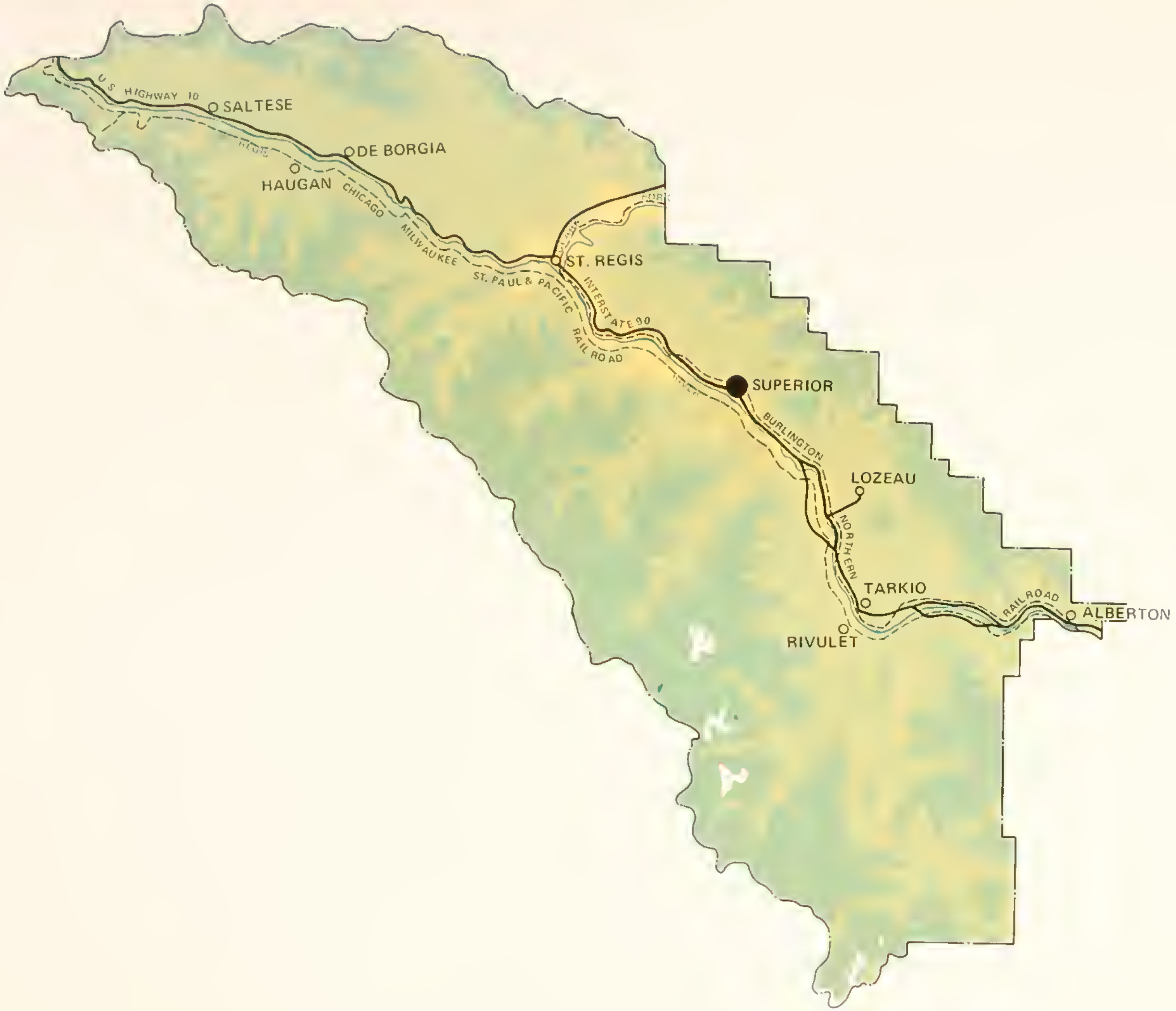
Map 13 Lozeau

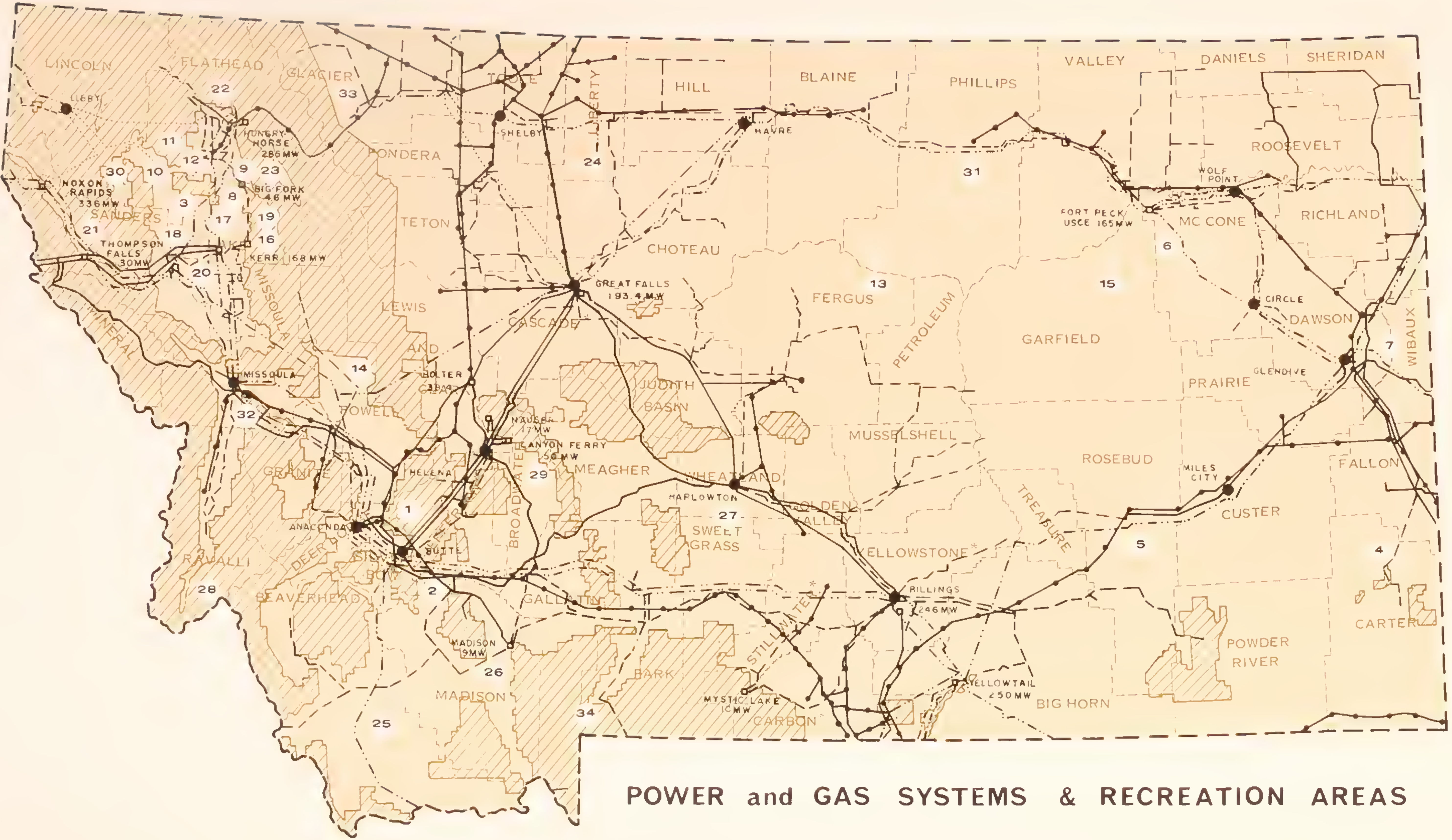
Mineral County Sewer System

Map 14 Superior
Map 15 St Regis
Map 16 Alberton
Map 17 Saltese
Map 18 DeBorgia



MINERAL COUNTY
TOPOGRAPHY

MAP 1



POWER and GAS SYSTEMS & RECREATION AREAS

MAP 2

COUNTY MAP
GENERAL RELIEF

LEGEND

● CITIES-TOWNS

○ COUNTY SEAT

ROADS-HIGHWAYS
STATE HIGHWAY U. S. HIGHWAY

RAILROADS

STREAMS-LAKES

COUNTY BOUNDARY

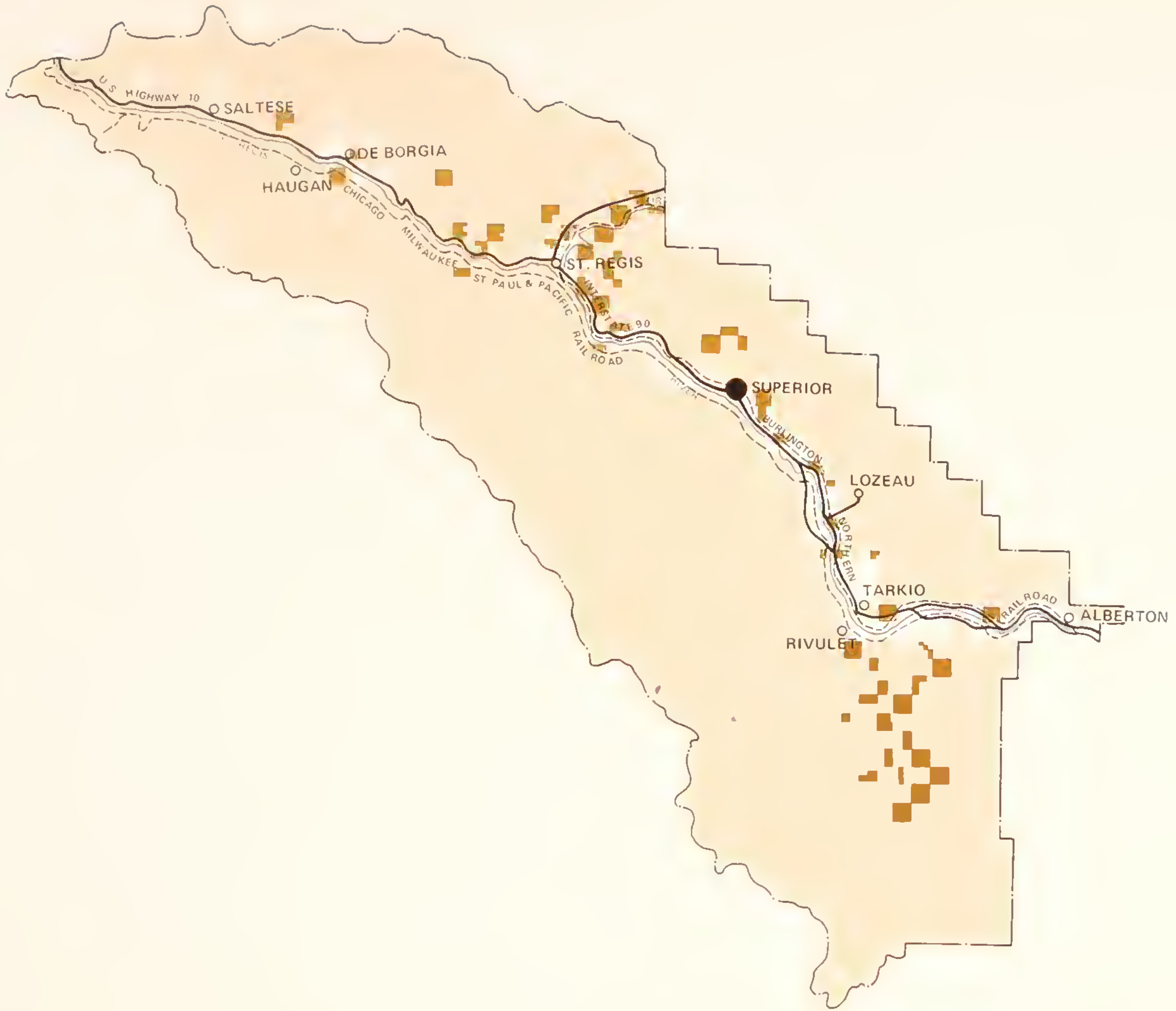
INDIAN RESERVATION

0-3,000 FT. ELEVATION

3-5,000 FT. ELEVATION

5-7,000 FT. ELEVATION

OVER 7,000 FT. ELEVATION



N

MINERAL COUNTY

LAND OWNERSHIP

SCALE
5 0 5 10 Miles

MAP 3

LEGEND

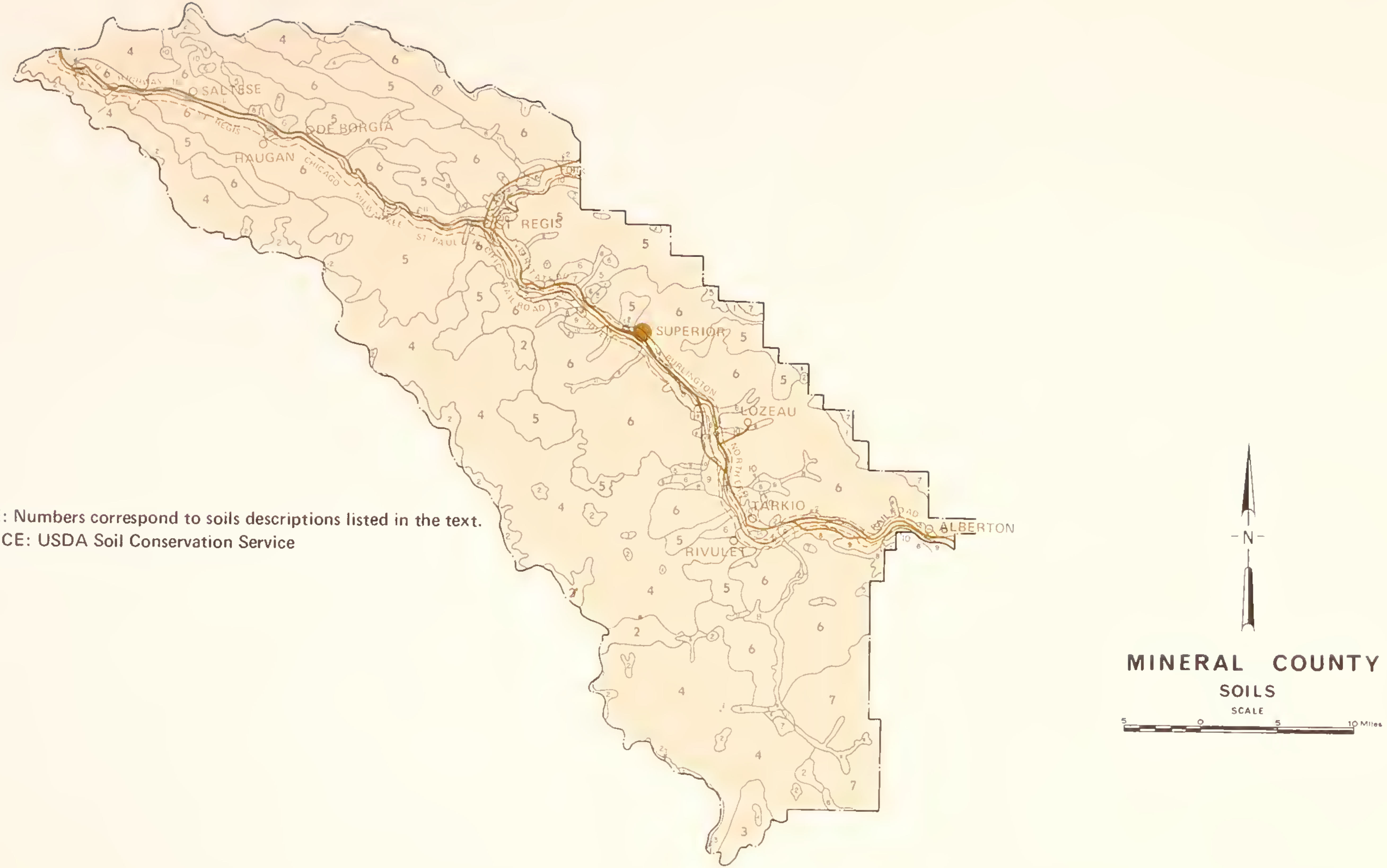
MAJOR STATE-WIDE COVERAGE

POWER AND GAS SYSTEMS

☐ POWER PLANT (IN MEGAWATTS)
┄┄ 1 to 50 KILOVOLTS
── 51 to 100 KILOVOLTS
─·─ 101+ KILOVOLTS
··· PROPOSED LINES
─•─ GAS LINES

RECREATION AREAS

1 LOST CREEK STATE PARK
2 LEWIS AND CLARK CAVERNS STATE PARK
3 LAKE MARY RONAN STATE PARK
4 MEDICINE ROCKS STATE PARK
5 ROSEBUD STATE PARK
6 ROCK CREEK STATE PARK
7. MAKOSHIKA STATE PARK
8. WEST SHORE STATE PARK
9 WOODS BAY STATE PARK
10 BITTERROOT LAKE STATE PARK
11 ASHLEY LAKE STATE PARK
12 LONE PINE STATE PARK
13. JAMES KIPP STATE PARK
14 HOOPER MEMORIAL STATE PARK
15. HELL CREEK STATE PARK
16. FINLEY POINT STATE PARK
17. ELMO STATE PARK
18. FLATHEAD LAKE STATE PARK
19 YELLOW BAY STATE PARK
20. WALSTAD MEMORIAL PARK
21. THOMPSON FALLS STATE PARK
22 WHITEFISH LAKE STATE PARK
23. WAYFARERS RECREATION AREA
24. TIBER RESERVOIR RECREATION AREA
25. CLARK CANYON RESERVOIR RECREATION AREA
26. ENNIS RECREATION AREA
27. DEADMAN'S BASIN RESERVOIR RECREATION AREA
28. PAINTED ROCKS RESERVOIR RECREATION AREA
29. CANYON FERRY RECREATION AREA
30. LOGAN PARK RECREATION AREA
31. NELSON RESERVOIR RECREATION AREA
32. BEAVERTAIL HILL RECREATION AREA
33. GLACIER NATIONAL PARK
34. YELLOWSTONE NATIONAL PARK
▨ NATIONAL FORESTS



NOTE: Numbers correspond to soils descriptions listed in the text.
SOURCE: USDA Soil Conservation Service

MINERAL COUNTY
SOILS
SCALE

MAP 4

COUNTY MAP
LAND OWNERSHIP

LEGEND

● CITIES-TOWNS

○ COUNTY SEAT

ROADS-HIGHWAYS
STATE HIGHWAY U.S. HIGHWAY

RAILROADS

STREAMS-LAKES

COUNTY BOUNDARY

INDIAN RESERVATION

▭ PRIVATELY OWNED LAND

▬ STATE OWNED LAND

▭ FEDERAL OWNED LAND

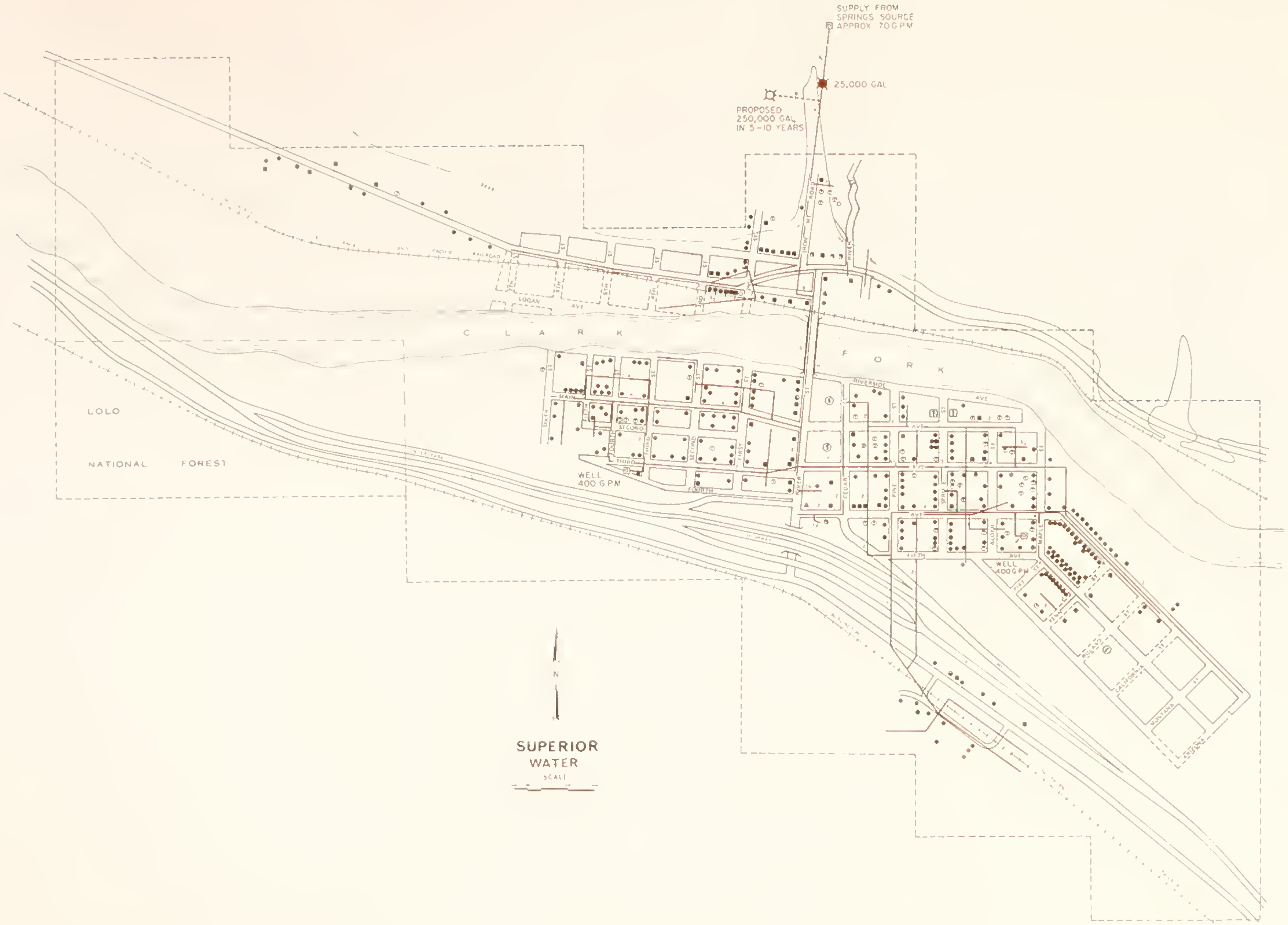
CITIES MAP LEGEND

LAND USE

●	SINGLE RESIDENCE
◒	DILAPIDATED RESIDENCE
Ⓣ	SINGLE TRAILER RESIDENCE
⊕	MULTIPLE RESIDENCE
○	APARTMENTS
🅃	TRAILER COURT
■	COMMERCIAL BUILDING
◪	HOTEL-MOTEL
△	PUBLIC BUILDING
S	SCHOOL
⬢	CHURCH
⊞	HOSPITAL
✸	INDUSTRIAL
E	GRAIN ELEVATOR

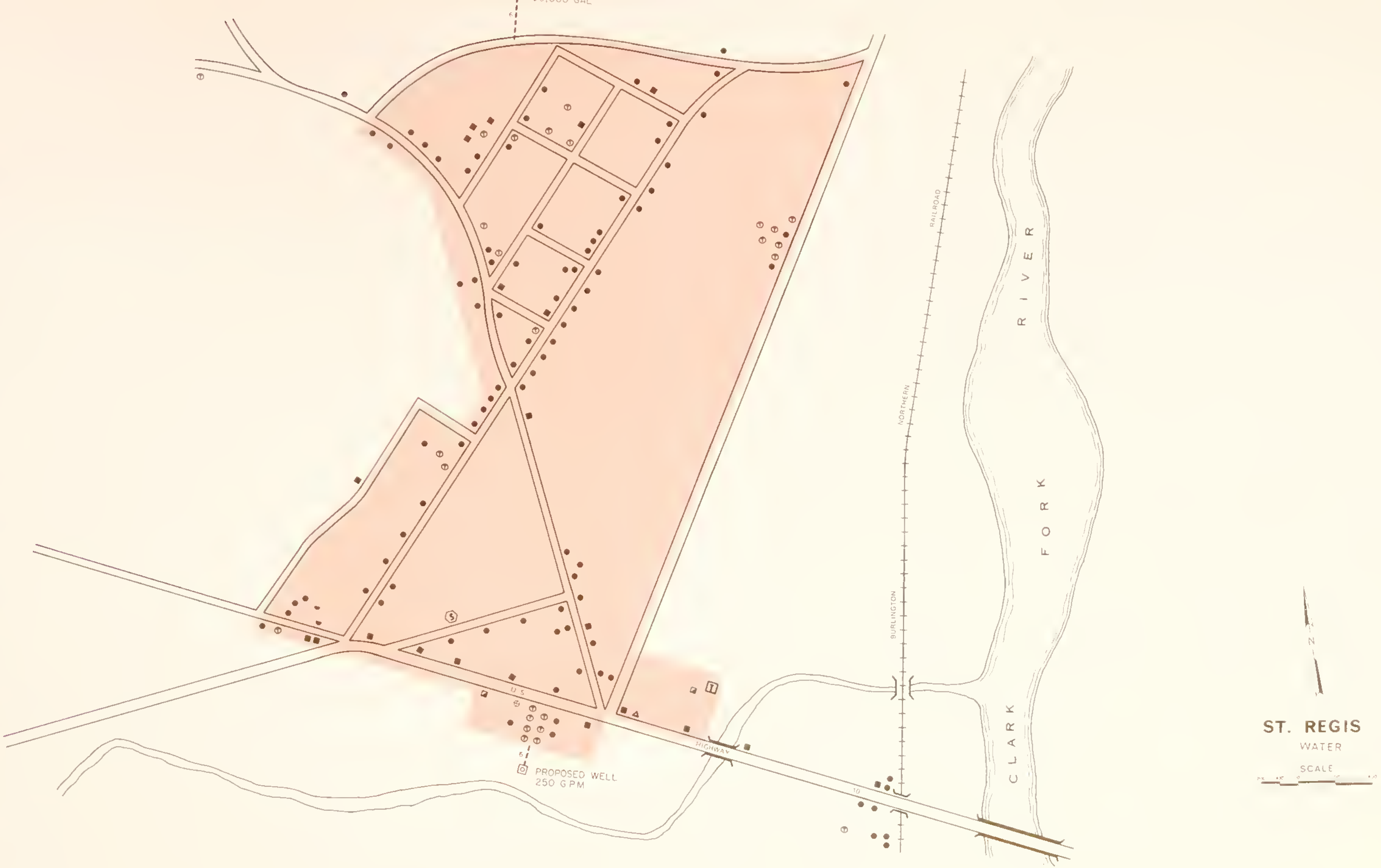
WATER and SEWER SYSTEMS

—6—	EXISTING LINES AND SIZES
- - - -	PROPOSED LINES 5-10 YEAR
········	PROPOSED LINES 10-20 YEAR
—◀—	EXISTING LIFT STATION
--◁--	PROPOSED LIFT STATION
●	EXISTING WATER STORAGE TANK
¤	PROPOSED WATER STORAGE TANK
—◎	EXISTING WATER SOURCE
--◎	PROPOSED WATER SOURCE
—☐	EXISTING TREATMENT FACILITIES
--☐	PROPOSED TREATMENT FACILITIES
▭	SERVICE AREA 1970-1980
🟥	SERVICE AREA BY 1990



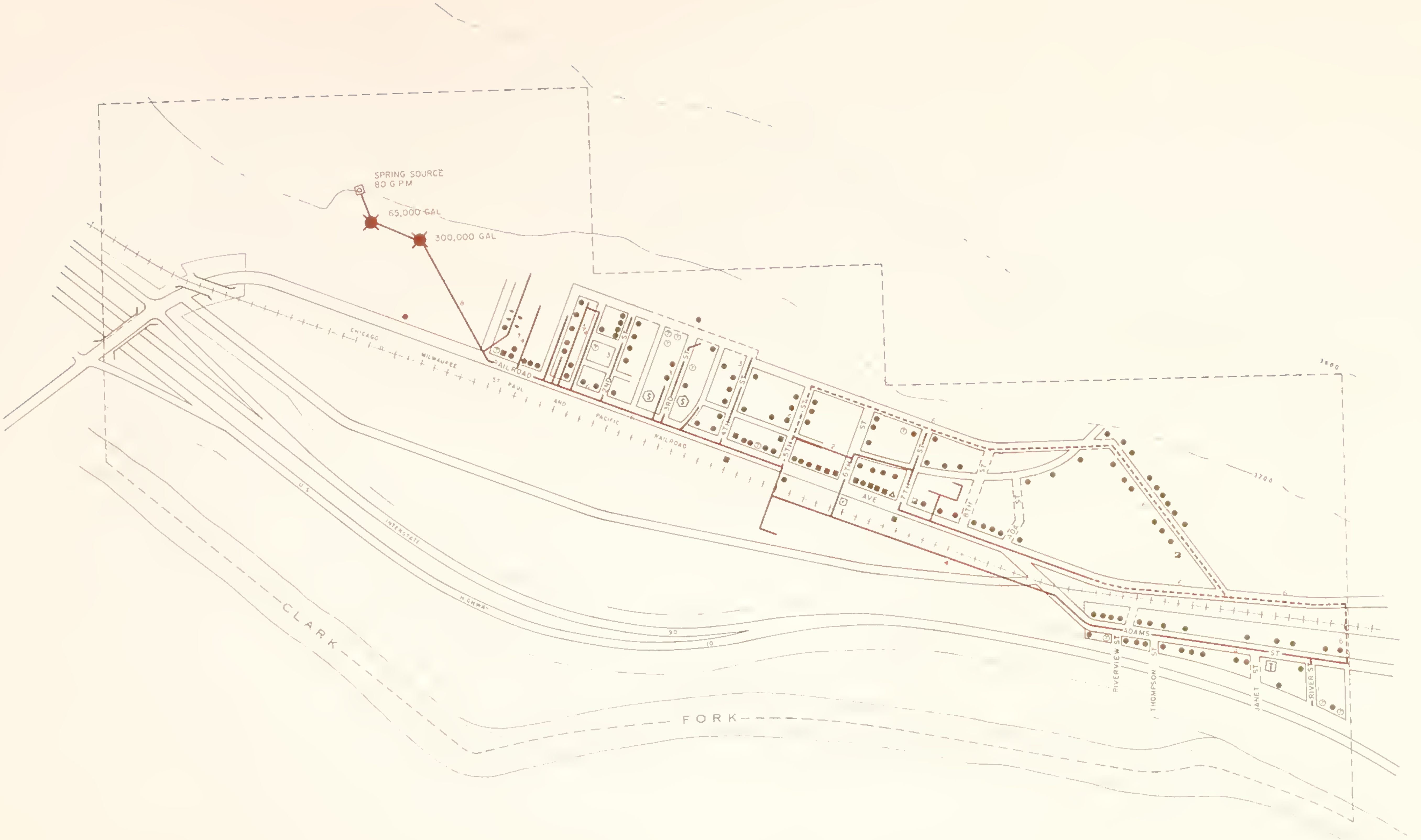
SUPERIOR
WATER

MAP 5



ST. REGIS
WATER

MAP 6

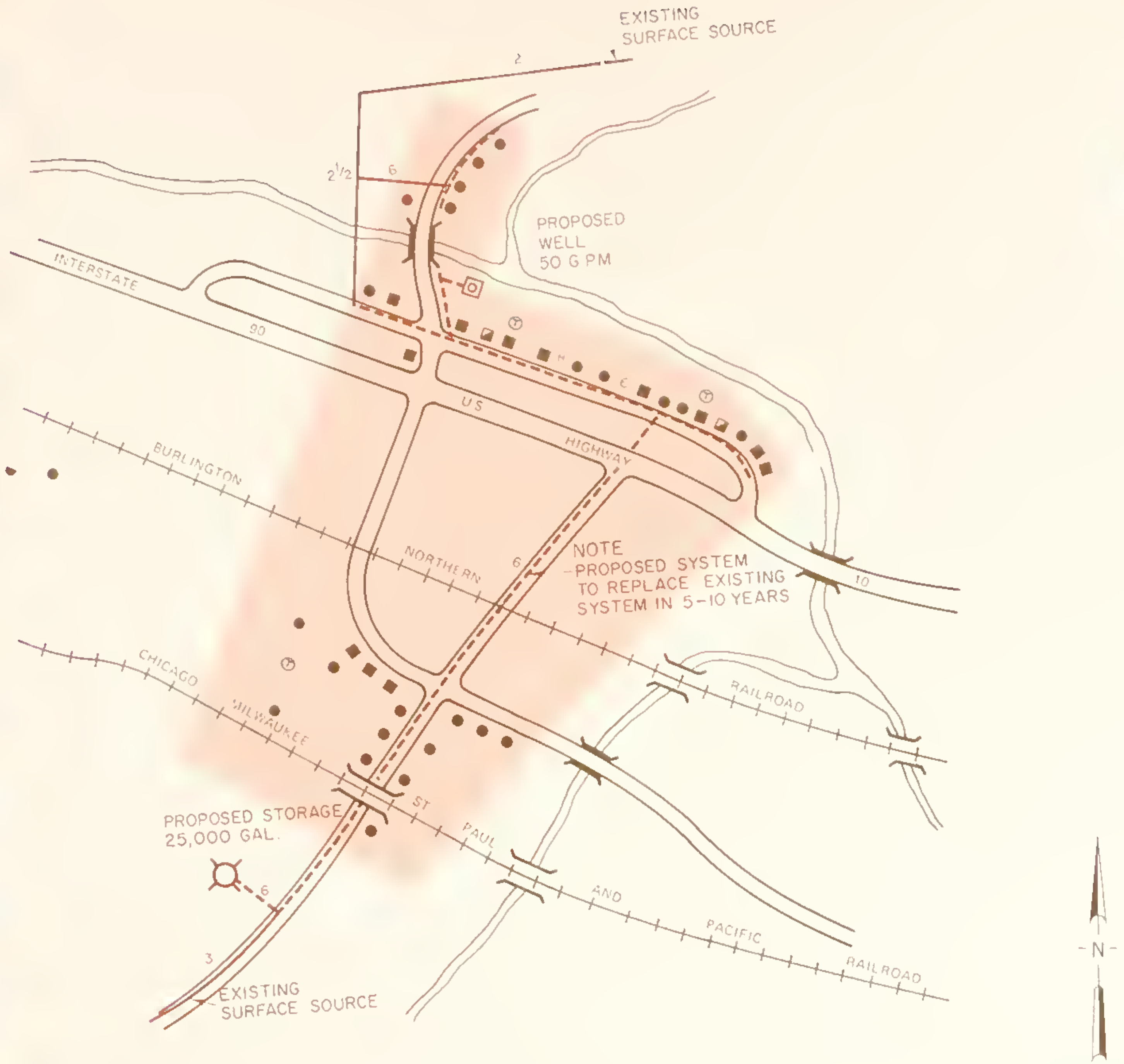


ALBERTON

WATER

SCALE

MAP 7

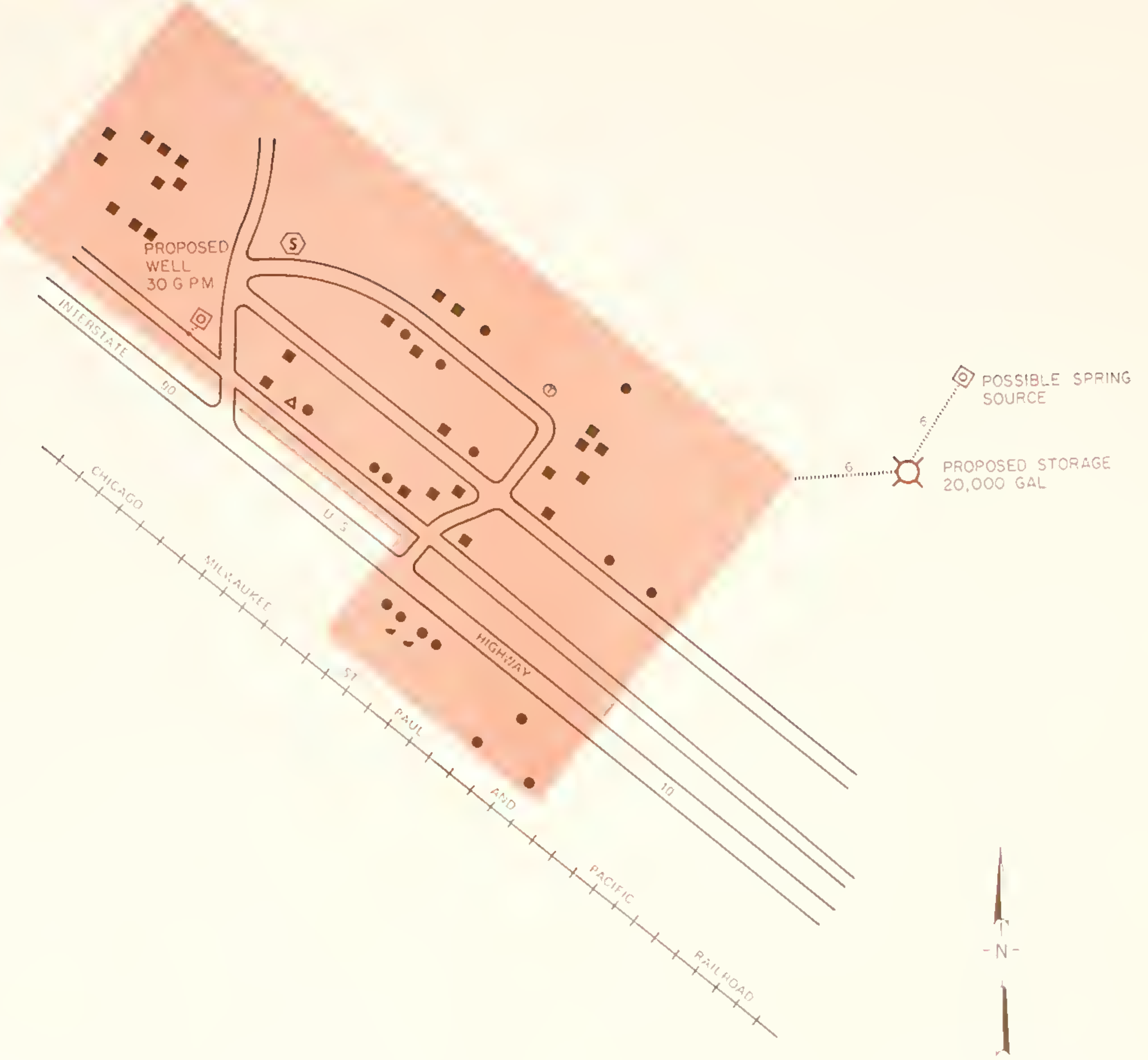


SALTESE

WATER

SCALE

MAP 8

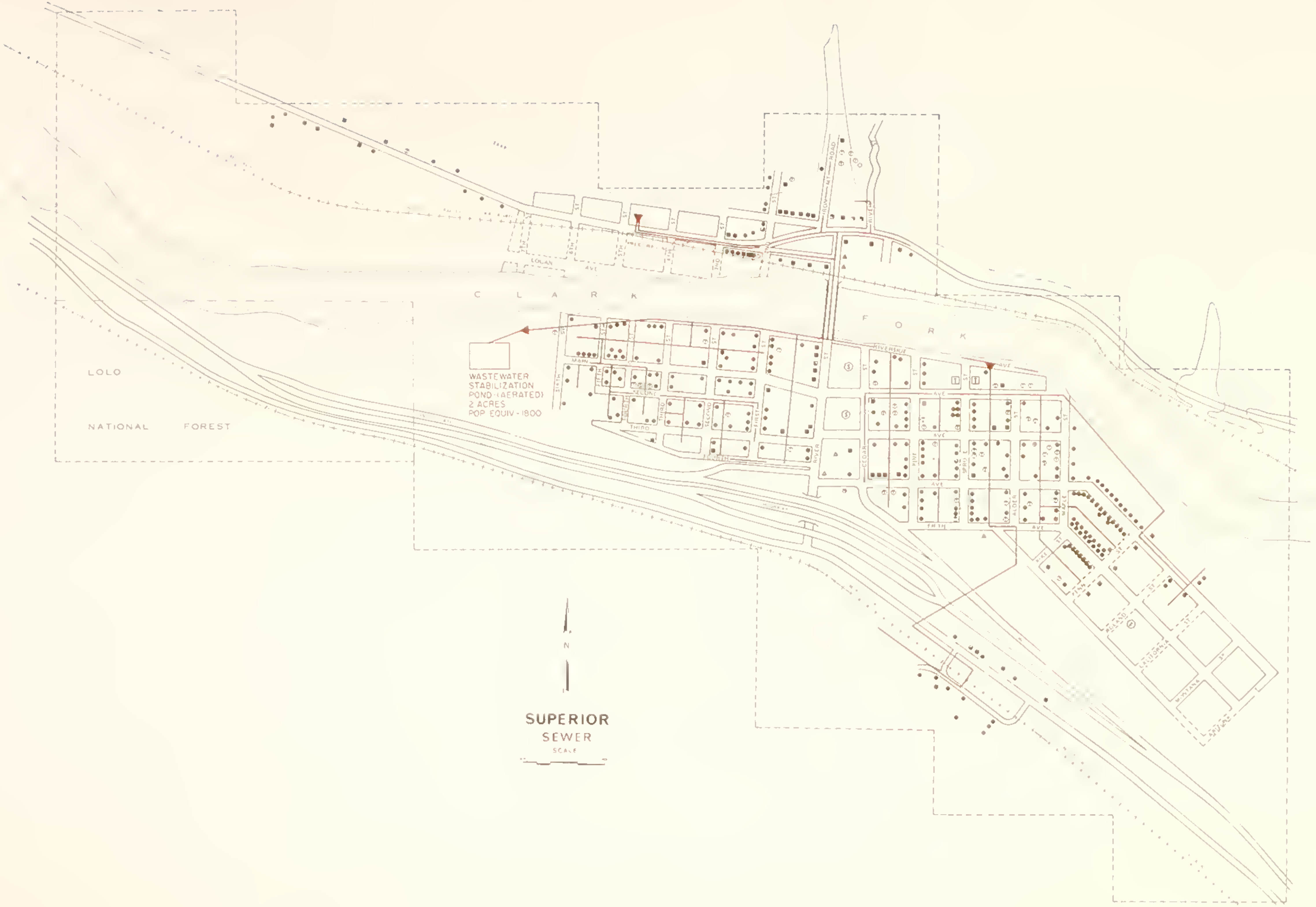


DE BORGIA

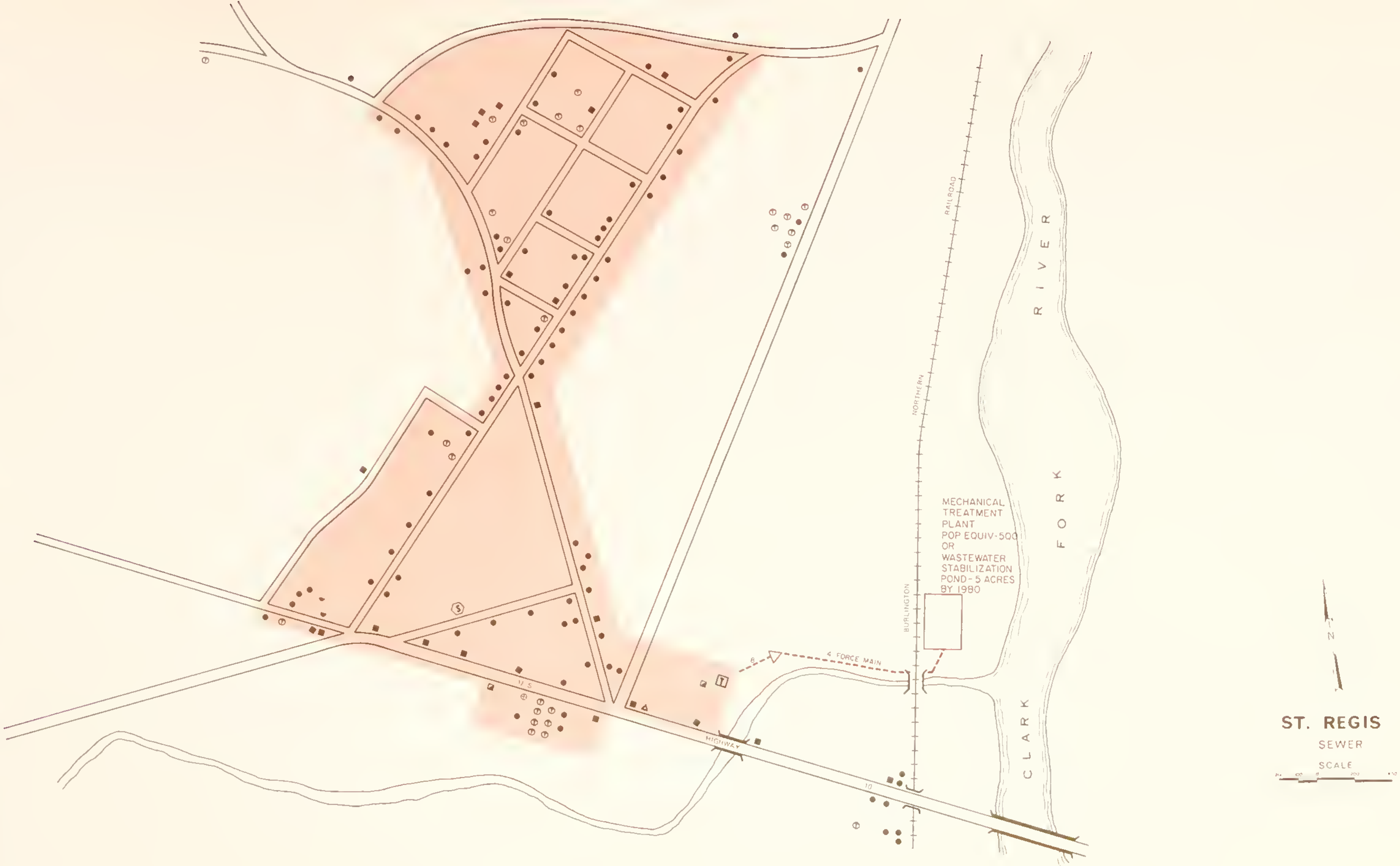
WATER

SCALE

MAP 9

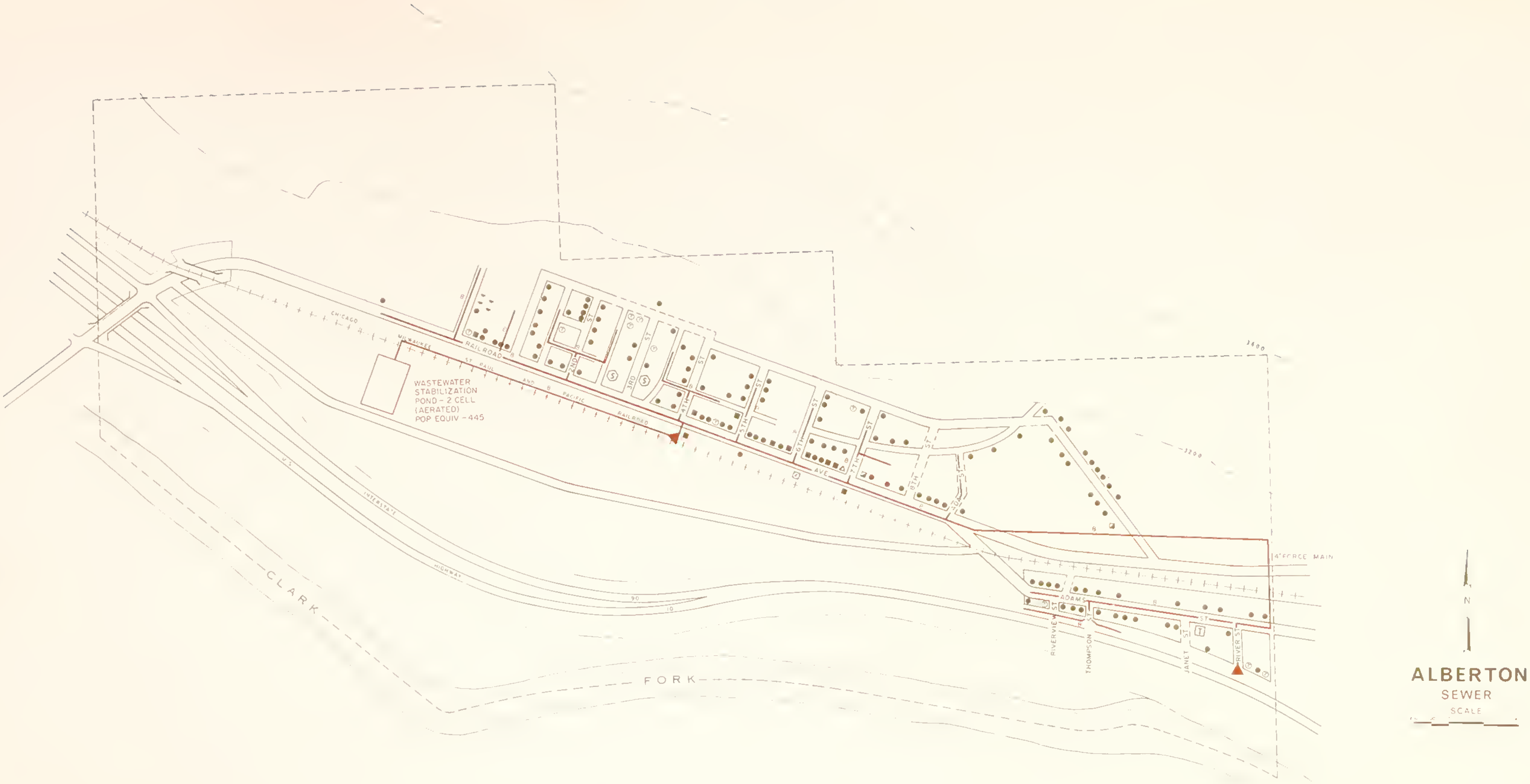

CLARK FORK
LOLO NATIONAL FOREST
WASTEWATER
STABILIZATION
POND-(AERATED)
2 ACRES
POP EQUIV - 1800
LOGAN AVE
MAIN
RIVERSIDE AVE
N
SUPERIOR
SEWER
SCALE

MAP 14

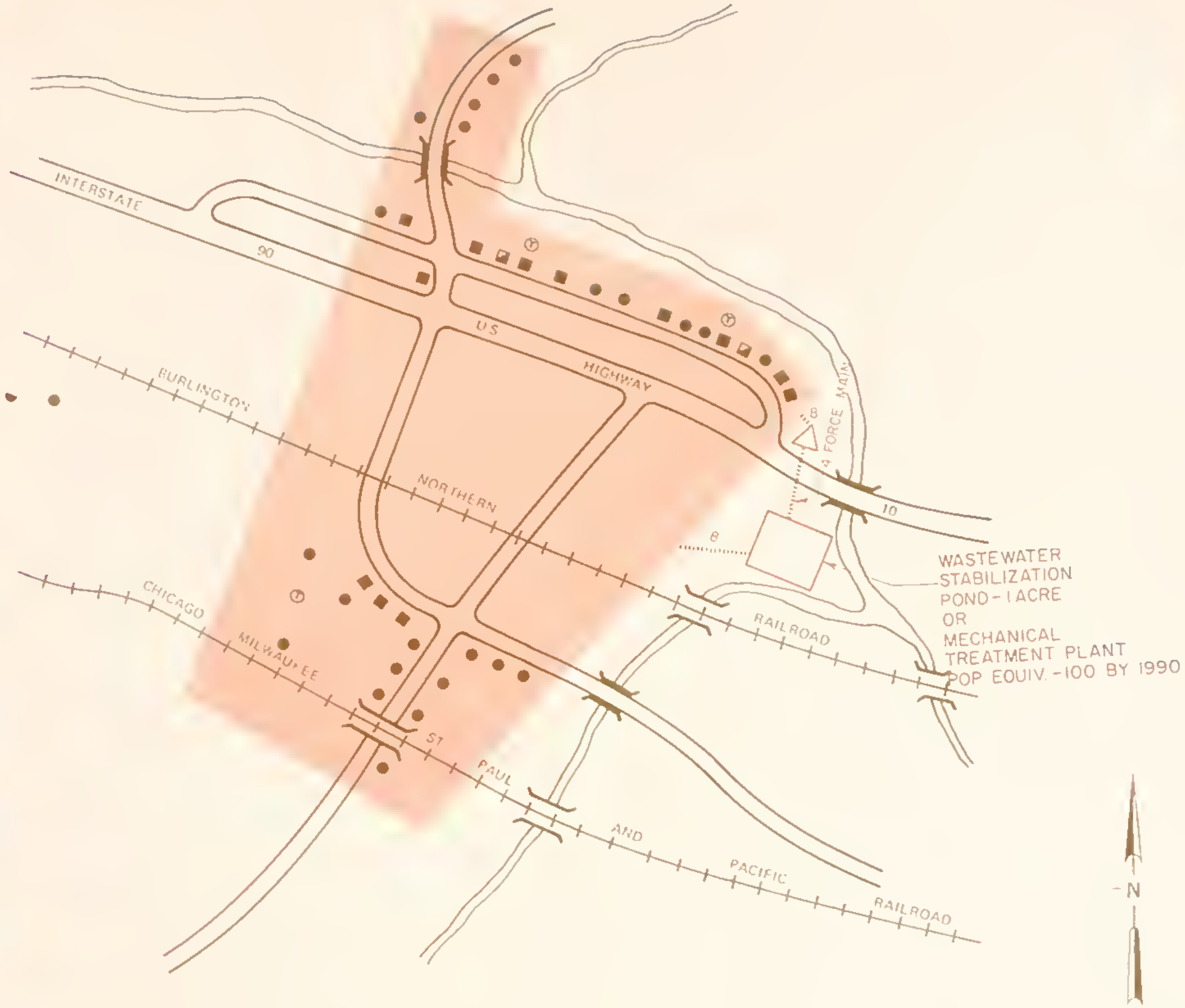


ST. REGIS
SEWER
SCALE
100
0
200
N
MECHANICAL
TREATMENT
PLANT
POP EQUIV-500
OR
WASTEWATER
STABILIZATION
POND-5 ACRES
BY 1980
BURLINGTON
NORTHERN
RAILROAD
CLARK
FORK
RIVER
4 FORCE MAIN
8
U.S.
HIGHWAY
10
S
T

MAP 15


WASTEWATER
STABILIZATION
POND - 2 CELL
(AERATED)
POP EQUIV - 445
CHICAGO
MILWAUKEE
ST PAUL
AND
PACIFIC
RAILROAD
RAILROAD
AVE
2ND
3RD
ST
4TH
5TH
6TH
7TH
8TH
ST
3200
3600
4" FORCE MAIN
ADAMS
ST
RIVERVIEW
ST
THOMPSON
ST
JANET
ST
RIVER ST
INTERSTATE
HIGHWAY
90
10
CLARK
FORK
N
ALBERTON
SEWER
SCALE

MAP 16

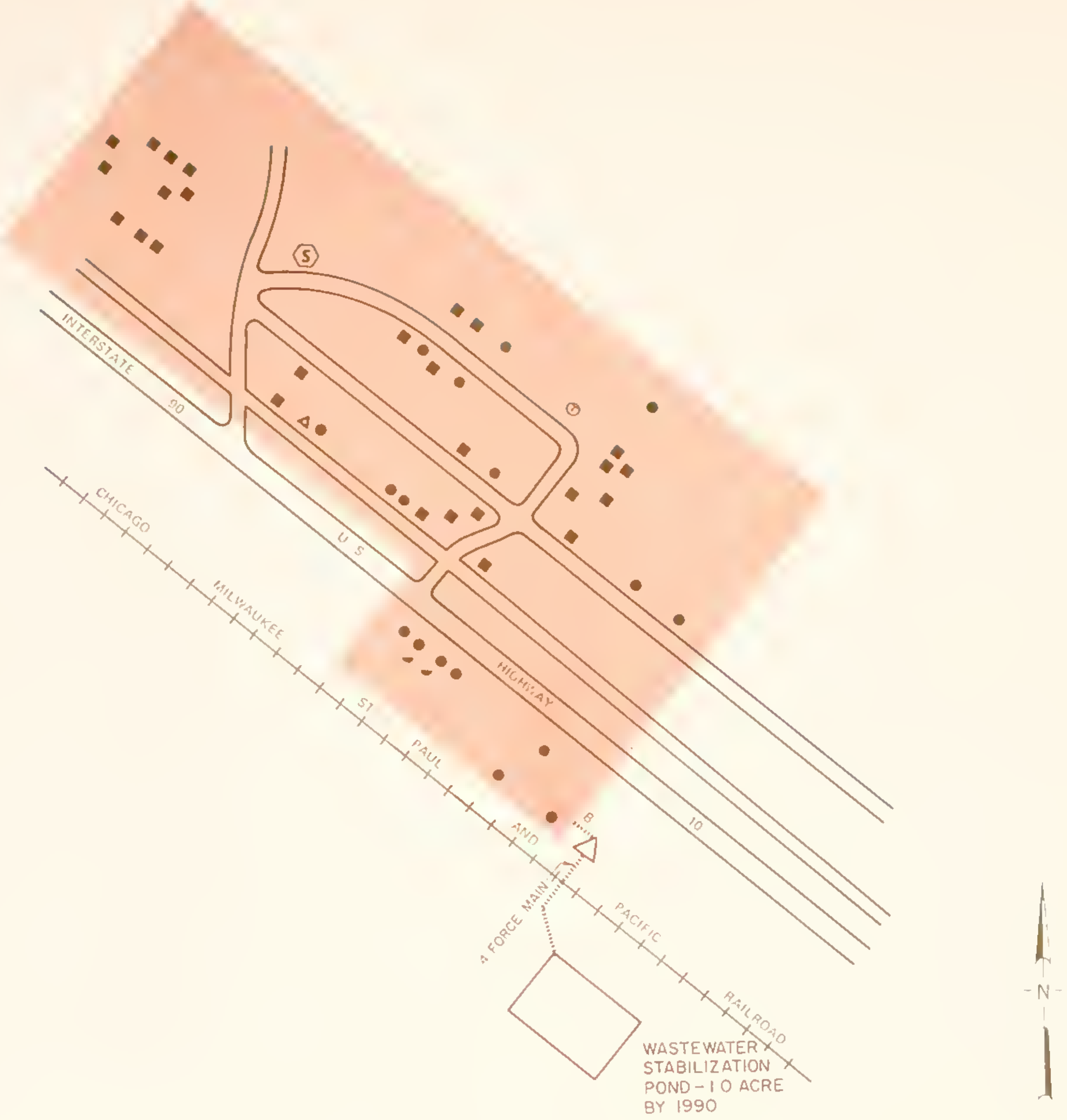


SALTESE

SEWER

SCALE

MAP 17



DE BORGIA

SEWER

SCALE

MAP 18